

REPORT

Monsanto Soda Springs Idaho Plant Groundwater and Surface Water Sampling and Analysis Plan

Submitted To: Monsanto Company

Soda Springs Plant

Highway 34

Soda Springs, Idaho 83276

Submitted By: Golder Associates Inc.

18300 NE Union Hill Road, Suite 200

Redmond, WA 98052 USA

Distribution:

Copies Monsanto, Soda Springs, Idaho
 Copy EPA Region X, Seattle, Washington
 Copy IDEQ-Pocatello, Idaho
 Copy Stochos Environmental Inc.
 Copies Golder Associates Inc., Redmond, Washington

April 29, 2010

913-1101.605A





April 2010 i 913-1101.605A

Table of Contents

1.0	INTRODUCTION	1
2.0	BACKGROUND	2
2.1	Site Conditions	2
2.	2.1.1 Hydrogeology	2
2.	2.1.2 History of Groundwater Effects	3
2.2	Record of Decision	5
3.0	SITE PROCEDURES AND HEALTH AND SAFETY	7
4.0	GROUNDWATER SAMPLING	g
4.1	Groundwater Levels	9
4.2	Groundwater Sampling	9
5.0	SURFACE WATER SAMPLING	13
5.1	Soda Creek	13
5.	5.1.1 Sampling Locations	14
5.2	Mormon Creek	15
5.3	Sampling Procedures	15
6.0	SPRING SAMPLING	16
6.1	Spring Locations	16
6.2	Sampling Procedures	16
7.0	PLANT NON-CONTACT COOLING WATER	17
7.1	Sampling Procedures	17
8.0	QUALITY ASSURANCE AND QUALITY CONTROL	18
8.1	Field Water Quality	18
8.2	Laboratory Water Quality	18
8.3	Chain of Custody	19
9.0	REFERENCES	20

List of Tables

Table 1	Well Completion Information
Table 2	Groundwater Remediation Goals for the Monsanto Plant
Table 3	Analytical Constituents, Preservatives, Holding Times, and Analytical Methods
Table 4	Monitoring Well Measuring Point Information
Table 5	Sample Collection Summary
Table 6	Field Parameter Stabilization Criteria

List of Figures

Figure 1	Monsanto Plant Vicinity Map
Figure 2	Locations of Wells and Springs
Figure 3	Monsanto Facility Map
Figure 4	Soda Creek Sample and Spring Locations



List of Appendices

Appendix A	Health and Safety Plan
Appendix B	Monsanto Health and Safety Procedures
Appendix C	Technical Procedures
Appendix D	Field Data Collection Forms
Appendix F	Quality Assurance Project Plan



1.0 INTRODUCTION

This document is a sampling and analysis plan for the collection of groundwater and surface water samples at the Monsanto Elemental Phosphorus Plant in Soda Springs, Idaho. This document is divided into several sections:

- Section 2 describes the Monsanto Soda Springs Plant including site conditions and a description of the hydrogeology;
- **Section 3** describes the site procedures and health and safety requirements;
- **Section 4** describes the sampling procedures for groundwater;
- **Section 5** describes the sampling procedures for surface water;
- Section 6 describes the sampling procedures for springs;
- Section 7 describes the sampling procedures for non-contact cooling water;
- Section 8 describes quality assurance and quality control procedures; and
- Section 9 contains references.

Also included are the Health and Safety Plan (Appendix A) and Monsanto Health and Safety Procedures (Appendix B), and Technical Procedures for the sampling work (Appendix C). Field data collection forms are included in Appendix D, and Appendix E contains the project Quality Assurance Project Plan.



2.0 BACKGROUND

The Monsanto Soda Springs Plant is located approximately one mile north of the City of Soda Springs, Caribou County, Idaho (Figure 1). Monsanto conducted a Remedial Investigation/Feasibility Study (RI/FS) under an Administrative Order on Consent (AOC) with the U.S. Environmental Protection Agency (USEPA). The purpose of the RI/FS (which began in 1991) was to determine the nature and extent of constituents at and near the Plant. The investigation included evaluations of soil, sediments, air emissions, surface water and groundwater.

A Record of Decision (ROD) was agreed upon by Monsanto and USEPA (USEPA 1997) that prescribes selected remedies for the affected environmental media at the site. For groundwater, the selected remedy is monitored natural attenuation with institutional controls. This remedy was selected based on groundwater modeling results that predict restoration of groundwater to concentrations below the remediation goals. Annual groundwater, surface water, and non-contact cooling water discharge monitoring is conducted at and near the Plant in order to ensure that natural attenuation is proceeding per modeled predictions, and to monitor the attenuation process. The annual sampling has occurred since 1991 and is performed in the spring (May or June) of each year.

2.1 Site Conditions

The Monsanto Soda Springs Plant is located one mile north of the City of Soda Springs, Caribou County, Idaho (Figure 1). The site covers an area of approximately 800 acres, with the plant accounting for 540 acres. Wells and springs at and in the vicinity of the Plant are shown on Figure 2. Operational Plant facilities are shown on Figure 3. Well completion information is summarized in Table 1 for monitoring wells and plant production wells at and in the vicinity of the Plant.

2.1.1 Hydrogeology

The hydrogeology at the Monsanto Plant is presented in detail in Golder Associates Inc. (Golder; 1995). The primary hydrostratigraphic zones underlying the Monsanto Plant include the Upper Basalt Zone (UBZ) and the Lower Basalt Zone (LBZ). The principal aquifer is the UBZ, which extends to a depth of about 100 feet bgs below the plant. Depth to the water table ranges from 20 feet bgs in the northeast corner to 100 feet bgs in the center of the plant. Groundwater flow in the UBZ and LBZ is a function of faulting, regional hydrogeologic conditions, and pumping of the plant production wells. The UBZ and LBZ are broken into smaller regions (UBZ-1 through UBZ-4 and LBZ-1 through LBZ-4), based on hydrogeological controls and groundwater quality (Figure 2). Details pertaining to the breakdown of UBZ and LBZ regions are provided in Golder (1995).

Within the plant area, the Monsanto Fault and Subsidiary Fault are hinge faults that separate the UBZ into distinct zones because of offsetting of permeable interflow zones against dense, low permeability flow interiors (Golder 1995). The faults act as barriers to groundwater flow in the Plant area. South of the Plant Fenceline, the offset on the faults decreases based on correlation of basalt flows and interflow



zones between boreholes and geophysical surveys (Golder 1995; Golder 2006; Golder 2007). The decrease in offset south of the Fenceline appears to result in some hydraulic communication between UBZ regions.

2.1.2 History of Groundwater Effects

Golder was initially employed to assess the impact of operations on groundwater and surface water quality at the Monsanto Plant in 1984. The 1984 study found elevated concentrations of cadmium, selenium, fluoride and sulfate in groundwater beneath the plant.

In 1992, a RI/FS was conducted by Golder and submitted to USEPA (Golder 1992). A Phase II RI/FS was conducted and submitted to USEPA in 1995 (Golder 1995). Bi-annual groundwater monitoring occurred from 1991 to 1998, and annual groundwater monitoring has occurred since 1998.

Groundwater affected by Monsanto activities is mainly confined to the UBZ within the plant, with groundwater flow toward the south plant fenceline. The migration of plumes originating within plant boundaries is monitored by wells located at the source areas, the south fenceline, and beyond the southern boundary of the site.

There are two constituent plumes on the site originating from Monsanto operations. Affected groundwater originates from three principal former source areas within the Monsanto Plant (Figure 3):

- Old Underflow Solids (UFS) ponds (UBZ-2)
- Northwest Pond (UBZ-4)
- Old Hydroclarifier (UBZ-4)

These source areas were closed and capped in the 1980's. Additional details on the closure of each of these source areas are included in Golder (1995). The plume from the old UFS ponds occurs in the UBZ-2 groundwater zone and flows within the groundwater system toward the south. The plumes from the Northwest Pond and the Old Hydroclarifier occur in the UBZ-4 zone and flow southward toward the plant production wells used for non-contact cooling water supply. Pumping from the production wells PW-01, PW-02, and PW-03 from UBZ-4 contains the plumes originating from the Northwest Pond and the Old Hydroclarifier areas to prevent offsite migration. There are other minor source areas on the site such as the former sewage lagoon the former unlined non-contact cooling water ponds, and the former coke and quartz ponds that are located within the UBZ-2 or UBZ-1 zones. These sources were characterized as part of the RI/FS process. The former sewage lagoon was identified as a potential source of nitrate and chloride. The old coke and quartzite ponds were characterized and found to have low to moderate concentrations of cadmium, fluoride, and selenium. The former non-contact cooling water pond received water that contained very low levels of selenium and cadmium. The coke and quartzite ponds and the sewage evaporation pond were capped with molten slag in the 1980's or 1990's. The non-contact cooling water pond was covered with molten slag and replaced with a pipeline to convey the effluent water a new



cooling pond near the NPDES outfall on Soda Creek. Additional details on the characterization and closure of each of the source areas are included in Golder (1995). The plume within the UBZ-2 zone that originates from the Old Underflow Solids Ponds is not controlled by pumping.

A fourth plume originates on the Tronox (formerly Kerr McGee Chemical Corporation; Figure 1) plant site, and has spread onto the southeastern portion of the Monsanto Plant site in the UBZ-3 area. Groundwater under the southeastern portion of the plant had elevated concentrations of vanadium, chloride, molybdenum, ammonium, and sulfate attributed to Tronox.

A groundwater solute transport model was developed as part of the Phase II RI for the Monsanto plant to predict the fate and transport of constituents in groundwater in the vicinity of the plant (Golder, 1995). The solute transport model was developed for the portion of the plant where there is potential for off-site transport of constituents in groundwater (the UBZ-2 zone). The model predicted concentrations to three endpoints south of the plant (the southern plant boundary, the estimated discharge point of the plume into Soda Creek, and the estimated discharge point of the plume into Bear River), as shown in Figure 2. Projections were calculated for constituent transport for a period of over 100 years.

In 2003, Golder conducted a Five-Year Review of the groundwater remedy employed at the Plant (Golder 2003), per conditions set in the Record of Decision (ROD). The Five-Year Review was the first of a series of reviews required to determine whether the remedy remains protective, to confirm that constituent concentration trends in groundwater are declining as predicted, and, eventually, confirm the achievement of Remediation Goals (RGs). A second Five-Year Review for the Monsanto site was completed in 2008, covering the period from 2003 to 2007, inclusive (Golder 2008).

The 2003 Five-Year Review report included statistical trend analyses and comparisons of groundwater and outfall quality to regulatory levels, remediation goals, and groundwater modeling projections to determine if/when remediation goals have been achieved, and if not, that institutional controls are still in place and effectively preventing human exposure. The analyses completed as part of the 2003 Five-Year Review report were updated as part of the Second Five-Year Review report completed in 2008 (Golder 2008a).

As part of the 2003 Five-Year Review, a revised groundwater model was developed to provide an improved projection of constituent concentrations in the UBZ-2 zone south of the Monsanto plant. The model was revised to account for observed changes in groundwater quality since the contaminant transport model was developed in 1993, and re-interpretation of the source area history and groundwater quality data from monitoring wells. The revised model used Goldsim (2002), a graphical, probabilistic contaminant transport modeling tool. The projections were updated as part of the Second Five-Year Review report (Golder 2008). The Second 5-Year Review report concluded that the remedy continues to function as intended and is protective.



Four new monitoring wells (TW-59, TW-60, TW-61, and TW-62) were installed south of the Southern Boundary wells in June and July 2007 to help delineate the southern extent of the groundwater plume in UBZ-1 and UBZ-2 (Golder 2007). The well locations are shown on Figure 2. The new wells were first sampled in July 2007, and have been added to the locations sampled as part of the annual groundwater sampling.

2.2 Record of Decision

The USEPA submitted a ROD in 1997 for the Monsanto site that presented the selected remedy for environmental media affected by plant operations (USEPA 1997). The selected remedy for groundwater is monitored natural attenuation with institutional controls to prevent human exposure to groundwater until groundwater quality improves to concentrations less than the remediation goals.

The ROD established groundwater remediation goals for the constituents of concern: cadmium, fluoride, nitrate, selenium, and manganese. The remediation goals are the MCLs under the Safe Drinking Water Act for cadmium, fluoride, nitrate, and selenium, and a risk-based concentration for manganese, as shown in Table 2.

Table 2
Groundwater Remediation Goals for the Monsanto Plant

Parameter	Remediation Goal (mg/L)	Regulatory Source
Cadmium	0.005	Maximum Contaminant Level
Fluoride	4	Maximum Contaminant Level
Nitrate as NO ₃ / Nitrate as N	44 /10	Maximum Contaminant Level
Selenium	0.05	Maximum Contaminant Level
Manganese	0.18	Risk-Based Concentration

The remediation goal for nitrate (44 mg/L) is the MCL for nitrate expressed as NO₃. However, the analytical data presented in this report are in the form of nitrate as expressed nitrogen (N). The equivalent remediation goal for nitrate as N is 10 mg/L.

The ROD established the points of compliance for remediation goal monitoring. Several modifications were made to the list of point of compliance wells, as described in Golder (1998), based on availability and accessibility of some wells. Based on the ROD and modifications to the ROD, the point of compliance wells are listed below:

- Production Wells Wells PW-01, PW-02, and PW-03
- Plant Fence Line Wells TW-20, TW-34, TW-35, and TW-39
- Southern Boundary Wells TW-53, TW-54, TW-55, and Harris well
- Soda Creek (surface water)



The Plant Fence Line wells are located inside the southern Plant fence line near Hooper Springs Road. The Southern Boundary wells are located within the Monsanto property boundary near its southern margin (about 1,200 ft south of the fence line). The well and spring locations are shown on Figure 2.

Several sample locations have been established to monitor and evaluate discharges to surface water (Soda Creek), and effects of discharges on surface water quality. These sample locations are not point of compliance locations, but are used to evaluate water quality in Soda Creek. The sample locations on Soda Creek for surface water quality are listed below and shown on Figure 4.



3.0 SITE PROCEDURES AND HEALTH AND SAFETY

Prior to commencing work on site, Golder personnel are required to complete the following health and safety procedures:

- 1. Stop at the security office at the plant entrance and check in. Monsanto will sign you in and give you a vehicle pass each day you are onsite that needs to be turned in when you leave at the end of the day.
- 2. On the first day of the field work, complete the Safety Orientation that reviews plant health and safety and security requirements
- 3. Golder will be assigned a Certified Manufacturing Representative (CMR) who will escort you for all work inside the plant, and possibly all work outside the plant as well. Bob Geddes or another Monsanto employee will sit down with you and the CMR and go over your work procedures. All health and safety requirements for each step of your work process will be addressed and written down.
- 4. Monsanto staff will review any additional plant rules and requirements at this time, including safety procedures.
- 5. Golder are permitted to take photographs in the Plant, however, we are not allowed to photograph manufacturing processes of any type. All photographs must be given to Bob Geddes or your CMR at the end of the sampling round. Monsanto will review all photographs before sending them to Golder.

Safety is a major priority in all aspects of Monsanto plant operations. In addition to the Golder Health and Safety Plan (Appendix A), Monsanto has comprehensive Health and Safety requirements for working inside and outside the Plant Fenceline (Appendix B). The following is a list of the major safety precautions/rules that are always required inside the Plant Fenceline. Additional requirements will be discussed during the site orientation.

- 1. Hard hats fitted with safety goggles are required at all times inside the Plant fenceline, including while driving. Safety goggles should be part of the equipment brought to the site.
- 2. Safety glasses (clear or sunglasses) with side shields or that wrap around to protect the sides of the eyes must be worn at all times.
- 3. Steel-toed boots, long pants, and long-sleeved shirts are required at all times inside the Plant fenceline.
- 4. High-visibility safety vests should be worn when sampling along roads inside and outside the Plant and in the stockpile area.
- 5. Ear plugs are required in certain areas of the Plant such as inside well houses and around the Hydroclarifier.
- 6. The vehicle must be equipped with a first aid kit, fire extinguisher, and respirators fitted appropriately for each team member.
- 7. Stay within the posted speed limits. The speed limit is 15 miles per hour, 10 miles per hour in some sections of the Plant.



- 8. Always drive with headlights on.
- 9. Always yield right of way to pot carriers and other heavy equipment.
- 10. Foot travel in the Plant area is allowed only in designated walkways.
- 11. Always stop at the Plant railroad crossings. Do not park or work within eight feet of any railroad tracks.
- 12. Always get eye contact with heavy equipment operators before approaching or operating near them. Make sure they have acknowledged you and are aware of your location.
- 13. Inform the yard manager or heavy equipment group manager when you will be working in the central heavy equipment and stockpile area of the plant. Your CMR can coordinate this.
- 14. Outside of the Plant fenceline, hardhats and safety goggles are not required. Steel toed shoes, safety glasses, and long-sleeved shirts should be worn when working outside of the Plant fenceline.
- 15. Ticks, mosquitoes, and fire ants are present inside and outside the Plant fenceline. Apply insect repellant before working and re-apply during the day, particularly when sampling springs and surface water outside the Plant fenceline or in vegetated or grassy areas of the Plant.
- 16. Use caution walking in and outside of the Plant fenceline. Inside the fenceline, some wells are located behind berms of loose slag that need to be climbed or are in areas of uneven terrain with loose rocks or slag fragments. Outside the fenceline, the ground can be uneven rocky, or muddy, particularly around springs and streams, or have loose rocks or wood or tall grass and vegetation. Use care when crossing barbed wire fences when no gates are available. There may be old barbed wire fences hidden in grass or bushes around springs, particularly Mormon A Spring and Calf Spring.



4.0 GROUNDWATER SAMPLING

Groundwater sampling consists of measurement of groundwater levels in all wells in the Plant and outside of the Plant, and collection of groundwater quality samples from most wells inside and outside of the Plant. Most of the wells to be sampled are completed in the UBZ. There are several wells completed in the LBZ that are also sampled. The well locations are shown on Figure 2. The analytical parameters are summarized on Table 3. The Golder Project Manager should be contacted prior to ordering bottles from the laboratory to determine if additional constituents should be added to the list.

4.1 Groundwater Levels

Groundwater level measurements should be collected at all wells at the Monsanto plant where access for a water level probe exists (all wells except for the Plant production wells). Groundwater levels shall be measured in all wells, regardless of whether they are sampled or not, in accordance with technical guideline TG-1.4-6a Technical Guideline for Manual Groundwater Level Measurement (Appendix C). The existing wells at the Monsanto site and measuring point information are summarized on Table 4. It is not necessary that the groundwater level measurements all be done on the same day but within the time period of the sampling event Water level monitoring involves the following steps:.

- 1. Decontaminate the water level tape with distilled water and paper towels (and Alconox if necessary) before each water level measurement.
- 2. Measure the groundwater level in each well. The measuring points are indicated with "MP" and arrow (if pump wires are colored, take groundwater level inside pump riser pipe if pump wires are white, take groundwater level through hole in well seal) on most wells. The measuring points are also summarized on Table 3. The groundwater level should be measured to the nearest 0.01 foot.
- 3. IMPORTANT Lower the water level tape slowly and smoothly into each well equipped with a pump. Do not "jiggle" water level indicator down into well if it is stuck bring it up at least 5 feet and gently lower it down again this will prevent the indicator from becoming entangled in the pump wires which is a problem in several wells (TW-16, TW-26, and TW-44).
- 4. The measurement should be checked against previous measurements (Table 1) to ensure no measurement errors occurred. If the measurement is significantly different than previous measurements, the measurement should be repeated.
- 5. The groundwater level measurement and the date and time shall be recorded on a groundwater level monitoring form (Appendix D).

4.2 Groundwater Sampling

Wells at the Monsanto Plant are equipped with several different types of sampling equipment:

- Many wells have dedicated ½ or ¾ hp pumps installed. These wells require a generator and starter box (in most cases) to run the pump and a well riser to direct the pump discharge.
- Plant production wells have dedicated well pumps installed. Each production well has a sampling tap installed on the wellhead piping.



- Selected wells inside and outside the Plant do not have dedicated pumps installed. Sampling in these wells is completed using non-dedicated bailers or a Grundfos pump. The Grundfos pump requires a generator for power.
- One irrigation well (Lewis Well) is sampled. The well has a dedicated pump installed.
 The well is sampled at an irrigation riser near the well.

A listing of wells to be sampled and any notes about pump size, starter box information, purge water disposal, purging rate, and other well-specific information is summarized on Table 5. Using the information in Table 5, select the correct well riser and starter box (if needed) for the well to be sampled.

Groundwater sampling procedures shall be in accordance with technical guideline TG-1.2-20 *Technical Guideline for Collection of Groundwater Quality Samples*.

For all sampling locations:

- Calculate the well volume to be purged based on the depth to water and the well
 construction information in Table 1. Assume a porosity of 25% for the gravel pack
 materials. Check Table 5 for any wells that need to be purged slowly to avoid
 dewatering the well or to avoid disturbing the well and causing high turbidity.
- 2. Take at least three sets of field parameters or until parameters stabilize (Table 6) and the turbidity is less than 5 NTU and preferably less than 1 NTU (Table 6), and purge a minimum of three well volumes.
- 3. Tape over labels on bottles with clear packaging tape before filling this will prevent labels from disintegrating when wet.
- 4. Fill the sample bottles to the neck. Add the appropriate preservative to each sample bottle (if needed) immediately following sampling.
- 5. Place all sample bottles in plastic Ziploc bags before storing. Placing all bottles from one well in one bag makes it easier to handle when inventorying, preparing chain of custodies or preparing for shipping. All samples should be stored on ice until transferred to the refrigerator in the lab basement.
- 6. Note any damage to the well, pump wires, or well protective monuments that requires repair. Take photographs as necessary to document any damage.

For wells with dedicated sampling pumps (½ or ¾ hp sampling pumps):

- a) Put on the dedicated well risers (stored in the Monsanto lab basement). There is a dedicated well riser made up for each well with a dedicated pump (see Table 5). They are in plastic garbage bags with the well numbers marked in duct tape on the outside and on the riser. Put the dedicated well pump riser corresponding to the well to be sampled onto the well cap adapter.
- b) Check pump horsepower (on Table 5) for use with correct starter box most pumps are ½ hp, deeper wells in the LBZ are ¾ hp. Note some of the newer wells (such as TW-53 through TW-57, inclusive, and TW-59 through TW-62, inclusive) do not need a starter box and plug directly into the generator.



- c) Connect a hose to the riser. If the purge water is to be collected, per Table 5, pump water into purge tank on truck. If not, let it flow on the ground. Measure the pumping rate using a container of known volume and a stopwatch. Note if the well must be purged slowly to avoid pumping the well dry or causing excessive turbidity. Table 5 summarizes recommended well pumping rates.
- d) Purge a minimum of three well volumes; collect field water quality parameters (temperature, pH, conductivity, turbidity, and dissolved oxygen) throughout the purging period. The field water quality parameters should be recorded on a sample integrity data sheet (Appendix D).
- e) Continue purging until a minimum of three well volumes have been purged, the field parameters are stable in accordance with the Technical Procedures (Appendix C) and Table 6, and the turbidity is less than five NTU (and preferably less than one NTU).
- f) After sampling, disconnect the hose, starter box and well riser. Replace all caps or plugs. Make note of any signs of disrepair on the well, including missing plugs, cracks in the well seal or concrete pad.

For wells without dedicated pumps (non-production wells):

- a) Decontaminate the Grundfos pump (for wells TW-08, TW-24, TW-38, and the Harris Well) inside and out using Alconox detergent and distilled water and install the sampling tubing. Set the pump at the appropriate depth in the well to pump out three well volumes without the well going dry or causing excessive turbidity. Wells TW-40 and TW-43 are sampled with dedicated bailers that are stored inside the wells.
- b) Connect a hose to the Grundfos outflow. If the purge water is to be collected, pump water into the purge tank. If not, let it flow on the ground.
- c) Pump out or bail a minimum of three well volumes; collect and record field water quality parameters throughout the pumping or bailing. Bailed wells will likely be high turbidity and should be field filtered. No other samples should be filtered.
- d) After sampling, decontaminate the Grundfos pump as it is pulled from the well using Alconox and distilled water. The temporary sample tubing can be discarded. Replace all caps or plugs.

For the Plant production wells and the Lewis Well completed with dedicated pumps:

a) Locate the tap where the sample is to be collected from (Plant Production Wells) or irrigation riser (Lewis Well) and turn it on and let run for about five minutes. If one of the production wells is not running, find someone at the plant (Boiler operator) to turn it on. Dave Mathews (Laboratory manager) or Bob Geddes (Environmental Manager) can arrange this. Some of the wells operate



- on demand and may cycle on and off depending on the Plant water requirements. Check in with the Boiler operator to see which wells are operating and when they are cycling on.
- b) After sampling, notify Monsanto to turn off the production well pump if it was not on prior to sampling.
- c) For the Lewis well, open the irrigation standpipe on the north side of the driveway. You may need to disconnect some fittings and open or close some valves. Allow the water to discharge from the standpipe for at least 20 minutes to purge the well and any water in the irrigation system. Make sure you reattach any hoses or valves that were removed for the sampling.
- d) For all wells, purge at least three (3) well volumes and keep purging until turbidity is less than five (5) NTU before sampling (and preferably less than one NTU).



5.0 SURFACE WATER SAMPLING

Surface water samples are collected from Soda Creek at several locations and at Mormon Creek, a small tributary of Soda Creek, irrigation canals, and from power generation returns. The flow will be measured at the same time as the sample is collected.

5.1 Soda Creek

Soda Creek is the principal drainage in the area of the Monsanto Plant. Soda Creek originates at Fivemile Meadows, about 3.5 miles northwest of the Plant. Fivemile Meadows is an approximate 800 acre area of marshland and springs. Over the period 1965 to 1986, the USGS operated a gage on Soda Creek at Fivemile Meadows. The average annual flow over that period was 18 cfs, and ranged from about 6 to 35 cfs.

From Fivemile Meadows, Soda Creek Flows south to Soda Creek Reservoir located about one mile east of the Plant (Figure 4). Soda Creek Reservoir is used to impound water for irrigation. The impounded water is also used for power generation. There are three powerhouses located along Soda Creek downstream of Soda Creek Reservoir, located about 5,000 feet, 10,000 feet, and 11,000 feet downstream of the Soda Reservoir Spillway. Soda Creek eventually discharges to Alexander Reservoir, located on the Bear River about three miles southeast of the Plant.

The principal natural tributary to Soda Creek below Soda Creek Reservoir is Hooper Spring, which discharges about 1 to 2 cfs to the creek about one mile downstream of the reservoir. There are also several smaller springs and seeps that discharge to Soda Creek below Hooper Spring. Non-contact cooling water from the Plant is also discharged to Soda Creek about 1,700 feet below Hooper Springs. The discharge rate is about 4 cfs.

About 100 feet south (downstream) of the non-contact cooling water discharge, the majority of the flow in Soda Creek is diverted into a power and irrigation canal at a diversion weir (Figure 4). Most of the flow is returned to Soda Creek from the second and third powerhouses. The flow in Soda Creek immediately below the diversion consists mainly of seepage through the flashboards at the diversion. Above the diversion, the stream is swiftly moving in a defined channel. Below the diversion, Soda Creek is a small, slow-moving, meandering creek that is severely flow-impacted and choked with vegetation. There are several small tributaries to Soda Creek below the diversion, including Southwest Spring (about 0.5 to 1 cfs) and Mormon Creek (about 0.5 cfs). Mormon Creek is the combined discharge of Calf Spring, Mormon A, B, and C Springs, and diffuse groundwater discharge. Mormon A Spring is the principal tributary of Mormon Creek.



5.1.1 Sampling Locations

Sampling stations have been established at the following locations on Soda Creek. The sampling locations are shown on Figure 4.

- SC-1 (Soda Up Station) Soda Creek upstream of the discharge pipe (sampled since 2001). This location is about 250 feet upstream of the discharge pipe, and about 1,800 feet downstream of Hooper Springs, which discharges at about 1 to 2 cfs to Soda Creek. Flow at this station consists of discharge from Hooper Springs and Soda Creek Reservoir, located about one mile upstream. Some of the discharge from Soda Creek Reservoir is diverted for power generation and returned to Soda Creek near Hooper Spring.
- SC-2 (Soda Weir Station) Soda Creek downstream of the effluent discharge, about 25 feet upstream of the weir diverting flow to the irrigation canal and power diversion (sampling initiated in 2005), and about 60 feet downstream of the discharge pipe. Flow at this location consists of flow in the creek and the effluent discharge.
- SC-3 (Soda Mid Station) Soda Creek, about 50 feet upstream of the Mormon Creek confluence (sampling initiated in September 2008) and about 1,400 feet downstream of the diversion weir. At this location, flow in Soda Creek consists of a small amount of flow that bypasses the irrigation and power diversion weir, discharge from Southwest Spring, and diffuse seepage to the creek. Flow at this station is severely impaired because of the upstream power and irrigation diversion.
- SC-4 (Soda Down Station) Soda Creek downstream of the discharge pipe (sampled since 2001). This location is about 3,200 feet downstream of the diversion weir and 1,800 feet downstream of the Mormon Creek confluence. Flow at this station consists of creek flow that bypasses the diversion weir, discharge from Southwest Spring and Mormon Creek, and diffuse seepage. Flow at this station is severely impaired because of the upstream power and irrigation diversion.

New sampling stations will be installed on Soda Creek and the irrigation and power canal returns at the following locations (Figure 4). The sample locations shown on Figure 4 are approximate and will be confirmed during the May 2010 sampling round. The final sample locations will be surveyed with a hand-held GPS unit:

- SC-5 (Soda Creek Below Weir) Soda Creek approximately 300 feet downstream of the irrigation and power diversion weir.
- SC-6 (Soda Creek at Property Line) Soda Creek at the south Monsanto Property Line.
- SC-7 (Soda Upstream of Power Return) Soda Creek approximately 100 feet upstream of the power returns.
- PR-1 (Power Canal Return) returns from the power plant prior to mixing with Soda Creek.
- SC-8 (Soda Creek Downstream of Power Returns) Soda Creek approximately 100 feet downstream of the power returns where the returns are well-mixed with the creek flow.
- SC-9 (Soda Creek at North Main Street)— Soda Creek upstream of the discharge to Alexander Reservoir, where Soda Creek crosses North Main Street)



5.2 Mormon Creek

Mormon Creek is a spring-fed tributary to Soda Creek. Mormon Creek discharges to Soda Creek below the irrigation and power diversion weir, immediately downstream of the Soda Mid station (Figure 4). Mormon Creek at its confluence with Soda Creek (sampled since 2002). Mormon Creek is fed by discharge from Mormon A, B, and C Springs, Calf Spring, and diffuse seepage. Flow in Mormon Creek is estimated to be less than 0.5 cfs

Mormon Creek is sampled immediately above the confluence with Soda Creek, at an old bridge crossing (Station MC-1).

5.3 Sampling Procedures

Surface water samples and flow measurements will be collected in accordance with technical procedures TP1.2-26 Surface Water Sampling Methods and TP-1.2-27 Measurement of Stream Discharge Using a Current Meter and the following steps:

- 1. Establish a permanent sampling and flow measurement locations at each station using rebar or fence posts.
- Photograph any new sampling locations and locate the sampling location using a GPS.
- 3. Measure the flow using a Swoffer current meter in accordance with technical procedure TP-1.2-27 *Measurement of Stream Discharge Using a Current Meter* (Appendix C). The data collection forms are included in Attachment D.
- 4. Collect a minimum of three sets of field water quality parameters (temperature, pH, conductivity, turbidity, and dissolved oxygen).
- Collect the water quality sample in accordance with technical procedure TP1.2-26
 Surface Water Sampling Methods (Appendix C). Fill the sample bottles to the neck.

 Add the appropriate preservative to each sample bottle (if needed) immediately following sampling. The samples should never be filtered.
- 6. Place all sample bottles in plastic Ziploc bags before storing. Placing all bottles from one site in one bag makes it easier to handle when inventorying, preparing chain of custodies or preparing for shipping. All samples should be stored on ice until transferred to the refrigerator in the lab basement.



6.0 SPRING SAMPLING

Water quality samples and flow measurements are collected at several springs outside of the Monsanto Plant Fence line.

6.1 Spring Locations

Samples are collected at the following springs:

- Mormon A Spring;
- Mormon B Spring;
- Mormon C Spring;
- Calf Spring;
- Southwest Spring;
- Homestead Spring;
- City Park Spring; and
- Big Spring.

The spring locations are shown on Figures 2 and 4.

Additional springs may be sampled at the discretion of Monsanto or the Golder project manager.

6.2 Sampling Procedures

Spring water samples and flow measurements will be collected in accordance with the technical procedure TP1.2-26 *Surface Water Sampling Methods* (Appendix C) and the following steps:

- Measure the spring discharge using bucket or container of known volume and a stopwatch. It may not be possible to measure the flow at Calf Spring, City Park Spring, or Big Spring because of the constraints of the spring location and lack of a suitable flow measuring location. The data collection forms are included in Appendix D.
- 2. Collect a minimum of three sets of field water quality parameters (temperature, pH, conductivity, turbidity, and dissolved oxygen).
- 3. Fill the sample bottles to the neck. For some springs with low flow (Homestead, Calf, and Mormon B and C Springs), the bottles may need to be filled from a decontaminated sample cup. Add the appropriate preservative to each sample bottle (if needed) immediately following sampling. Spring samples should not be filtered regardless of turbidity.
- 4. Place all sample bottles in plastic Ziploc bags before storing. Placing all bottles from one site in one bag makes it easier to handle when inventorying, preparing chain of custodies or preparing for shipping. All samples should be stored on ice until transferred to the refrigerator in the lab basement.



7.0 PLANT NON-CONTACT COOLING WATER

Non-contact cooling water is water from Plant Production Wells PW-01, PW-02, and PW-03) that is used to cool the furnace shell and other equipment. Non-contact cooling water is routed to a cooling pond located at the southeast corner of Government Dam Road and Hooper Road (Figure 2). From the cooling pond, the water is conveyed to Monsanto's permitted non-contact cooling water discharge on Soda Creek (Figure 2).

One grab sample is collected from the non-contact cooling water cooling pond where the pipe discharges into the pond.

Three grab samples are collected from the non-contact cooling water discharge pipe where the pipe discharges to Soda Creek.

7.1 Sampling Procedures

- 1. Collect a minimum of three sets of field water quality parameters (temperature, pH, conductivity, turbidity, and dissolved oxygen).
- 2. Collect the sample in accordance with the technical procedure TP1.2-26 *Surface Water Sampling Methods*. Fill the sample bottles to the neck. Add the appropriate preservative to each sample bottle (if needed) immediately following sampling. The samples should never be filtered.
- 3. Place all sample bottles in plastic Ziploc bags before storing. Placing all bottles from one site in one bag makes it easier to handle when inventorying, preparing chain of custodies or preparing for shipping. All samples should be stored on ice until transferred to the refrigerator in the lab basement.



8.0 QUALITY ASSURANCE AND QUALITY CONTROL

8.1 Field Water Quality

Field groundwater quality parameters (pH, dissolved oxygen, conductivity, turbidity, and temperature) will be measured using dedicated instruments. The instruments are calibrated daily at the start of the day using manufacturers' standards and the calibration parameters are recorded in the field logbook. The instruments are checked for drift twice a day against the standards and recalibrated if drift is observed. All measurement checks and recalibrations are recorded in the field logbook.

8.2 Laboratory Water Quality

The primary laboratory used for water quality analysis is SVL Analytical. The laboratory used for analysis of split samples is Analytical Resources Inc. Other laboratories may be used for specialized analytical services at the discretion of Monsanto or the Golder Project Manager.

Contact information for the primary laboratory is:

SVL Analytical
One Government Gulch
PO Box 929
Kellogg, ID 83837-0929
ATTENTION: Chris Meyer
(800) 597-7144 or (208) 784-1258
(208) 783-0891 (fax)

Contact information for the split laboratory is:

Analytical Resources Inc. 4611 South 134th Place Tukwila, WA 98168 ATTENTION: Mark Harris (206) 695-6200 (206) 695-6201 FAX

All analytical samples shall be subject to quality control (QC) measures in both the field and laboratory as detailed in the project QAPP (Appendix E). The following minimum field quality control requirements apply to all analyses. These requirements are adapted from Test Methods for Evaluating Solid Waste (SW-846), U.S. Environmental Protection Agency 2007.

■ Field duplicate samples. An effort will be made to obtain sufficient sample quantities for the purpose of collecting field duplicates. Field duplicates will be collected from surface and groundwater samples that are suspected, based upon field observations, to contain contaminants, and where volume requirements are sufficient. Duplicate samples shall be collected from the same sampling location using the same equipment and sampling technique, and shall be placed into identically prepared and preserved containers. At a minimum, duplicate samples will be generated for water collected from groundwater wells and surface water locations at a frequency of one duplicate per 20 samples. All field duplicates shall be identified with a unique sample ID number and will be analyzed independently (blind) as an indication of gross errors in sampling techniques;



- Split Laboratory samples. Split samples are identical samples collected at the same time in the same way, contained and transported in the same manner, but are sent to an alternate laboratory. Split samples are used as a performance audit of the primary laboratory. At a minimum, split samples will be generated for water collected from groundwater wells and surface water locations at a frequency of one duplicate per 20 samples. Split sampling shall be distributed evenly throughout each sampling period, with representative samples suspected to contain contaminants and where volume requirements are sufficient;
- **Equipment blanks**. Equipment blanks shall consist of pure deionized/distilled commercially available water washed through decontaminated non-dedicated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks verify the adequacy of sample containers, non-dedicated sampling equipment decontamination procedures, and the proficiency of the field technician to eliminate fugitive contaminants. One equipment blank will be generated for each non-dedicated sampling instrument used (bailer or pump). The equipment blanks shall be collected at a location based upon the potential for the presence of field contaminants; and
- *Trip blanks.* Trip blanks will not be required of the participating laboratory, unless and until contaminants are found in batch equipment blanks with interfering quantities of analytes that cannot be explained by sampling error, or by laboratory error. If required, they shall be created and tested by the laboratory prior to shipment, accompanied with the environmental sample set, and then returned unopened to the laboratory. The use of trip blanks will be at the Project Manager's direction, and are prepared as a check on possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions.

8.3 Chain of Custody

All samples obtained during the course of this investigation shall be assigned a unique sample number and controlled under Chain of Custody at all times in accordance with technical guideline TG-1.2-23 *Technical Guideline for Chain of Custody*. Chain of Custody forms (see Exhibit C in TG-1.2-23) shall be completed for each shipment of samples as described in the procedure. Sample Integrity Data Sheets shall be completed for all sample collection locations, and cross reference the location and sample depth with the sample identification entered on the Chain of Custody. All laboratory chain of custody and sample tracking procedures shall ensure traceability of analytical results to the original samples through the analytical method referenced on the chain of custody, and the laboratory applied tracking number, which is traceable to unique sample identification numbers.

Custody seals will be placed on the refrigerator in the lab basement used to store samples until they are shipped to the analytical laboratories.



9.0 REFERENCES

- Golder Associates Inc., 1992, Phase I Remedial Investigation/Feasibility Study, Preliminary Site Characterization Summary Report for the Soda Springs Elemental Phosphorus Plant, prepared for Monsanto Chemical Company by Golder Associates Inc., Redmond, Washington, April 23, 1992.
- Golder Associates Inc, 1995, Phase II Remedial Investigation Report for the Soda Springs Elemental Phosphorus Plant, May 1995.
- Golder Associates Inc, 1998, May 1998 Groundwater Status Solutia Soda Springs Site, Prepared for Monsanto Chemical Company,
- Golder Associates Inc, 2003, First Five-Year Review Report for Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs, Idaho, May 2003.
- Golder Associates Inc, 2006, Monsanto Soda Springs Plant Geophysical Survey South of Plant Site to Locate New Monitoring Wells, prepared for Monsanto Chemical Company by Golder Associates, Inc., Redmond, Washington.
- Golder Associates Inc, 2007, Well Completion Report, Monitoring Wells TW-59, TW-60, TW-61, and TW-62. November 2007.
- Golder Associates Inc, 2008, Second Five-Year Review Report for Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs, Idaho, July 2008.
- United States Environmental Protection Agency, 1997, Record of Decision, Monsanto Chemical Company Superfund Site, Caribou County, Idaho, United States Environmental Protection Agency Region 10, Office of Environmental Cleanup, Seattle Washington, April 1997.
- United States Environmental Protection Agency, 2007, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, revision 7, February 2007.



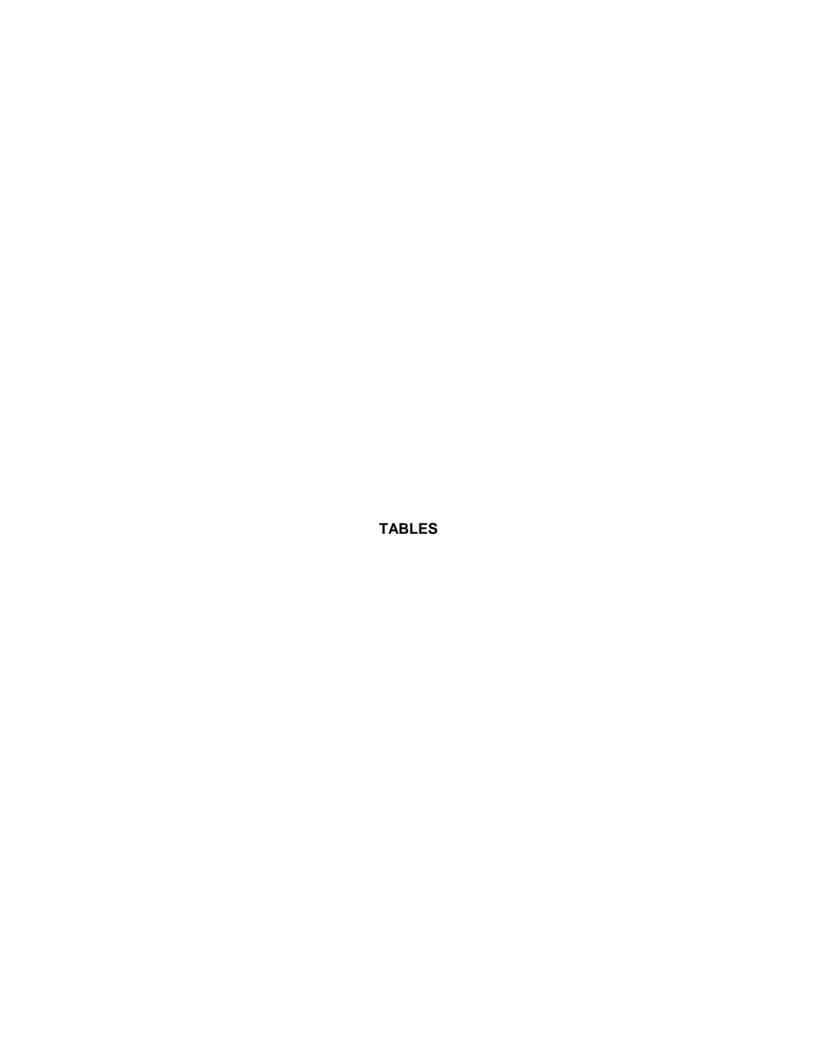


Table 1
Well Completion Information

		0.4.0111.0		ТОР	ВОТТОМ	MONITORER		SAND-		wei	OTATE BLANE	OTATE BLANE	analinin.	MEASURING	MONITORED	MONITORER	APPROX.	
	HOLE	CASING		MONITORED	MONITORED	MONITORED		PACK		WELL	STATE PLANE	STATE PLANE	GROUND	POINT (MP)	INTERVAL	MONITORED	DEPTH TO	
	DEPTH	DEPTH	CASING	INTERVAL	INTERVAL (feet	INTERVAL	MONITORED	LENGTH		CONSTRUCTION	COORDINATES	COORDINATES	ELEVATION	ELEVATION	ELEVATION	INTERVAL	WATER	APPROX. WELL
LOCATION	(feet bgs)	(feet bgs)	MATERIAL	(feet bgs)	bgs)	FROM	INTERVAL TO	(ft)	FLOW REGION	DATE	NORTHING	EASTING	(feet)	(feet)	FROM	ELEVATION TO	(feet bmp)	VOLUME (gal)
HARRIS	64	64	STEEL	58	62			4	UBZ-01	12/3/69	368,317.90	654,651.32	~5,878.78	5877.56			17.7	32
LEWIS	105	105	STEEL	85	105			20	ND	8/15/74	366,022.93	655,889.54	~5,863.35	5864.35			31.1	59
PW-01	ND	ND	STEEL						UBZ-04, LBZ-04	ND	372,453.32	656,074.00	~5,986.60	5987.37			108.44 bgs	-
PW-02	ND	ND	STEEL						UBZ-04, LBZ-04	ND	371,836.27	656,082.36	~5,986.40	5986.35			-	-
PW-03	255	100 255	STEEL			111.1	153.1		UBZ-04, LBZ-04	11/12/65	371,587.10	656,086.26	~5,988.60	5988.58	5877.48	5835.48	125.35 bgs	-
PW-04		94	PVC	105		106	229		LBZ-04	8/12/88	375,506.05	655,863.68	~5,990.80	5990.8			-	-
SO2 North	88	88	PVC	66	88			22			,	,	Í				67.47	15
SO2 South	80	80	PVC	58	80			22									56.1	17
TW-07		60	PVC			41.8	61.8	20		11/5/81	369,004.33	654,371.73	5884.5	5885.11	5843.31	5823.31	15.21	42
TW-08	90	90	PVC	74	90	76.24	91.2	14	UBZ-01	11/1/81	369.003.99	654.360.29	5884.7	5884.88	5808.64	5793.68	14.6	57
TW-09	253	251	PVC	236	251	237.89	252.9	16.7	LBZ-01	8/24/84	368,986.08	656,682.08	5883.9	5884.91	5647.02	5632.01	9.46	168
TW-10		24	PVC	19	24	19.56	25.6	9	UBZ-01	8/28/84	368.989.74	654.367.10	5884.4	5885.53	5865.97	5859.93	15.46	16
TW-11		137	PVC	127	137	129.12	138.5	9.4	LBZ-03	9/13/84	368.986.08	656.682.08	5936.6	5938.03	5808.91	5799.53	74.04	52
TW-12		100	PVC	84	102	88.55	103.8	15.3	UBZ-03	9/14/84	369.017.37	656.681.35	5937.6	5939.23	5850.68	5835.43	76.01	32
TW-13	98	96	PVC	79	96	82.23	100.2	19	0BZ-03	9/19/84	374.932.31	658.465.83	5986.4	5988.35	5905.92	5887.95	21.36	61
TW-13	24	21	PVC	12	25	15.55	26.6	9.5		9/19/84	374,932.31	658.474.42	5986.5	5988.59	5903.92	5961.99	16.65	5
	60	1	PVC		60	50.39	62.4	11.5	UBZ-04		374,949.49	,		5988.59		5961.99	21.36	33
TW-15		60		48						9/20/84	,	658,454.43	5986.5		5937.88			
TW-16 TW-17	82	77 107	PVC PVC	67 94	76 115	69.13 98.5	78.6 117.5	10 19.3	UBZ-04 UBZ-04	9/25/84 9/24/84	374,541.55 374,539.37	654,567.41 654,587.61	5996.9 5996.4	5998.39 5998.33	5929.26 5899.83	5919.79 5880.83	65.8 63.62	14 53
TW-17		234	PVC	219	238	221.75	240.8	19.3	LBZ-04	9/29/84	374,539.37	654,587.13	5994.6	5996.89	5775.14	5756.09	63.48	132
TW-19	30	29	PVC	213	200	25.43	31.8	5.5	LDZ-04	10/1/84	368,984.85	655,519.33	5891.2	5893.07	5867.64	5861.27	dry	102
TW-20	48	44	PVC	35	44	38.15	46.4	8.5	UBZ-02	10/2/84	368,975.43	655,503.64	5891.8	5893.37	5855.22	5846.97	31.4	15
TW-21	130	120	PVC	105	122	106.72	124.8	18.2	LBZ-02	10/8/84	368,969.43	655,528.89	5891.5	5893.68	5786.96	5768.88	26.46	73
TW-22	112	112	PVC	104	112	106.36	114.3	7.9	UBZ-02	10/16/84	371,421.14	654,280.62	5952.4	5954.7	5848.34	5840.4	73.31	31
TW-23		186	PVC	170	190	173.78	192.8	19	LBZ-02	10/16/84	371,421.83	654,265.62	5952.4	5954.52	5780.74	5761.72	73.88	94
TW-24	92	92	PVC	73	92	75.3	94.3	18	UBZ-02	10/16/84	371,435.86	654,273.24	5952.5	5954.43	5879.13	5860.13	73.25	22
TW-25		191	PVC					-		11/3/84	~372,218.00	~655,264.00	5995.8	NA			-	-
TW-26		142	PVC	136	142	138.99	145	6	UBZ-04	10/27/84	372,217.87	655,264.35	5995.6	5991.42	5852.43	5846.42	89.2	42
TW-27	98	95	PVC PVC	76	89	79.95	91.9	12.5	UBZ-04	10/30/84 11/6/84	~372,218.00 375,486.33	~655,264.00	5995.6	NA 5989.4	5909.45	5897.5	44.46	43
TW-28 TW-29	47	89 47	PVC	76 40	47	42.68	49.7	7.5	UBZ-04	11/2/84	375,486.33	654,189.48 654.187.34	5987 5987.7	5989.4	5909.45	5939.89	44.46	9
TW-30	69	69	PVC	62	69	64.69	71.7	6.9	UBZ-04	11/8/84	373,594.42	655,794.00	5991	5992.73	5928.04	5921.03	63.07	9
TW-31	42	30	PVC	23	31	25.14	34.1	8.5	UBZ-04	12/3/84	372,539.79	657.709.67	5973.9	5975.29	5950.15	5941.19	30.08	4
TW-32	190	166	PVC	151	166	154.51	168.5	14.8	LBZ-04	12/13/84	372,539.63	657,696.82	5974.1	5975.91	5821.4	5807.41	31.98	97
TW-33	75	74	PVC	67	75	69.11	77.1	7.9	UBZ-04	12/10/84	372,526.92	657,699.47	5974	5975.86	5906.57	5898.58	31.44	34
TW-34	74	74	PVC	68	74	69.92	76.4	6.5	UBZ-02	12/13/84	368,993.91	655,496.74	5891.6	5893.43	5823.51	5817.03	31.35	33
TW-35	128	83	PVC	71	84	73.53	86	17.7	UBZ-02	2/13/85	369,036.29	655,076.56	5895	5897.16	5823.63	5811.16	34.46	43
TW-37	102	100	PVC	93	100	96.32	102.9	6.6	UBZ-02	2/13/85	372,837.18	654,245.63	5957.1	5959.17	5862.85	5856.27	71.76	24
TW-38	102	102	PVC	90	102	92.72	104.7	12.1	UBZ-03	2/7/85	370,446.40	656,523.94	5970.9	5972.91	5880.19	5868.21	97.5	8
TW-39	57	56	PVC	48	56	50.57	58.1	7.8	UBZ-02	2/13/85	369,036.99	655,061.98	5895	5897.07	5846.5	5838.97	35.18	19
TW-40	89	89	PVC	82	89	84.32	91.3	6.8	UBZ-04	2/17/85	373,122.39	655,757.09	5988.3	5989.94	5905.62	5898.64	88.41	4
TW-41	68	68	PVC	55	68	57.86	70.9	13	UBZ-04	7/1/86	373,505.54	655,621.80	~5,991.50	5994.31	5936.45	5923.41	62.71	9



April 2010

Table 1 **Well Completion Information**

	1		1				1		1		1	1			1			
				TOP	BOTTOM			SAND-						MEASURING	MONITORED		APPROX.	
	HOLE	CASING		MONITORED	MONITORED	MONITORED		PACK		WELL	STATE PLANE	STATE PLANE	GROUND	POINT (MP)	INTERVAL	MONITORED	DEPTH TO	
	DEPTH	DEPTH	CASING		INTERVAL (feet	INTERVAL	MONITORED	LENGTH		CONSTRUCTION	COORDINATES	COORDINATES	ELEVATION	ELEVATION	ELEVATION	INTERVAL	WATER	APPROX. WELL
LOCATION									ELOW DEGION									
LOCATION	(feet bgs)	(feet bgs)	MATERIAL	(feet bgs)	bgs)	FROM	INTERVAL TO	(π)	FLOW REGION	DATE	NORTHING	EASTING	(feet)	(feet)	FROM	ELEVATION TO	(feet bmp)	VOLUME (gal)
HARRIS	64	64	STEEL	58	62			4	UBZ-01	12/3/69	368,317.90	654,651.32	~5,878.78	5877.56			17.7	32
TW-42	89	89	PVC	76	89	79.16	91.2	13	UBZ-04	7/1/86	373,178.57	655,840.05	~5,987.90	5990.07	5910.91	5898.87	86.07	7
TW-43	89	89	PVC			82.38	91.4	8		7/1/86	373,141.22	655,697.28	~5,986.70	5989.08	5906.7	5897.68	88.72	3
TW-44	148	148	PVC	129	148	131	150	18.58	LBZ-04	7/1/86	373,110.02	655,766.66	~5,987.40	5989.41	5858.41	5839.41	99.29	44
TW-45		228	PVC	214	228	216.79	230.8	14	LBZ-02	5/29/87	372,827.62	654,238.16	5957.3	5959.17	5742.38	5728.37	74.34	116
TW-48	73	71	PVC	65	71	67.31	73.3	6	UBZ-04	3/12/88	375,520.55	655,978.20	5987.8	5989.4	5921.88	5915.89	62.59	10
TW-49	82	82	PVC	73	82	75.21	84.2	9	UBZ-04	3/12/88	374,930.77	656,071.52	5995.9	5996.94	5921.93	5912.94	73.4	12
TW-50	89	89	PVC	73	89	73.78	90.8	17	UBZ-04	3/15/88	373,849.68	656,040.74	5992	5992.94	5919.16	5902.14	60.73	30
TW-53	62	31	PVC	18	32	19.54	34	14.3	UBZ-01	10/30/92	368,055.24	654,739.84	5878.35	5880.65	5860.85	5846.39	22.15	19
TW-54	76	50	PVC	37	52	39.26	54.3	15	UBZ-02	10/29/92	368,052.39	655,240.53	5886.7	5888.96	5849.7	5834.66	31.82	24
TW-55	69	66	PVC	52	67	53.5	69	14.9	UBZ-02	10/21/92	368,050.24	655,739.76	5884.33	5886.33	5832.83	5817.33	31.37	33
TW-56	106	96	PVC	85	98	86.8	100.3	13.5	UBZ-03	10/28/92	367,979.10	656,276.06	5907.7	5910.2	5823.2	5809.7	61.33	39
TW-57	35	35	PVC	21	35	23.18	37.3	14.1	UBZ-02	10/24/92	374,365.91	654,000.20	5950.36	5952.74	5929.36	5915.24	13.3	22
TW-58	55	52	STEEL	37	52	54.9	38.9	15.4	UBZ-02	11/3/92	368,980.16	655,458.20	5889.84	5892.74	5837.84	5853.84	31.71	22
TW-59	63	41	PVC	29	43			14	UBZ-02	6/27/07	365,662.80	654,853.50	5855.89	-	-	-	19.23	17
TW-60	79	56	PVC	43	56.5			13.5	UBZ-01	6/30/07	366,126.70	653,945.10	5866.98	-			31.67	17
TW-61	80	74	PVC	61.5	74.5			13	UBZ-01	7/2/07	367,105.20	653,964.70	5876.17	-			32.57	28
TW-62	67	60.6	PVC	46.5	63.5			17	UBZ-02	7/7/07	366,945.50	655,320.40	5878.67	-			31.94	22

Notes:
bgs - below ground surface
MP - measuring point

ND - no data

NA - not applicable

April 2010 913-1101.605A

Table 3
Analytical Consituents, Preservatives, Holding Times, and Analytical Methods

Analytical Constituents	Duagamenting	Haldina Time	Amplestical Matheada
Analytical Constituents	Preservative	Holding Time	Analytical Methods
Total Metals			
Cadmium	Cool, 4° C: HNO ₃ to pH<2	6 months	6010C
Calcium	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Magnesium	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Manganese	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Molybdenum	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Potassium	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Selenium	Cool, 4°C: HNO ₃ to pH<2	6 months	ICAP with hydride generation ^a
Sodium	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Vanadium	Cool, 4°C: HNO ₃ to pH<2	6 months	6010C
Zinc	Cool, 4° C: HNO ₃ to pH<2	6 months	6010C
Other lons			
Total Alkalinity (as CaCO3)	Cool, 4°C	14 days	2320B
Ammonia and Ammonium as N	Cool, 4°C; H ₂ SO ₄ to pH<2	28 days	350.1
Chloride	Cool, 4°C	28 days	300
Fluoride	Cool, 4°C	28 days	300
Nitrate and Nitrite As N	Cool, 4°C; H ₂ SO ₄ to pH<2	28 days	353.2
Total Phosphorus	Cool, 4°C; H ₂ SO ₄ to pH<2	28 days	365.2
Sulfate	Cool, 4°C	28 days	300
TDS	Cool, 4°C	7 days	SM 2540 C
Field Parameters			
Conductivity	None required	None required	None required
Dissolved Oxygen	None required	None required	None required
рН	None required	None required	None required
Turbidity	None required	None required	None required
Temperature	None required	None required	None required

Notes:

a. 6010C and SM 3114C



913-1101.605A Page 1 of 2

Table 4
Monitoring Well Measuring Point Information

TW-07	Well	Formation	Measuring Point (MP) (per RI Report)	MP Elevation	Top of Monitored Interval (feet bgs)	Bottom of Monitored Interval (feet bgs)	Hole Diameter (inches)	Casing Diameter (inches)	SP Northing	SP Easting	Comment
TW-08		UBZ	Top of steel 1" pipe	5877.56	58	62			368,317.90	654,651.32	MP = 4.05' above well-house floor
TW-09							_				
TW-10											Top of PVC well cap
TW-11 LBZ Top of coupling 5938.03 129.12 138.5 8 4 388,986.08 656.682.08 Top of coupling = 0.25 above TO TW-12 UBZ Top of seal 5939.23 88.55 103.8 8 4 369,017.37 656.681.35 Top of seal = 0.07 above TOC TW-13 SLZ Top of seal 5988.35 81 96 8 4 374,949.49 658,474.42 Top of seal 5988.35 81 96 8 4 374,949.49 658,474.42 Top of seal 5988.27 50.39 62.4 8 4 374,947.60 658,465.43 Top of seal 5988.27 50.39 62.4 8 4 374,947.60 658,465.43 Top of seal 5988.27 50.39 62.4 8 4 374,947.60 658,454.34 Top of seal 6.90 above TOC TW-16 UBZ Top of seal 5998.39 69.13 78.6 8 4 374,541.55 654,567.41 Top of seal 6.90 above TOC TW-17 UBZ Top of seal 5998.39 89.5 117.5 8 4 374,531.55 654,567.41 Top of seal 6.00 above TOC TW-19 UBZ Top of seal 5998.39 221.75 240.8 8 4 374,530.88 654,567.11 Top of seal 6.00 above TOC TW-19 UBZ Top of seal 5998.39 38.5 117.5 8 4 374,530.88 654,567.13 Top of seal 6.00 above TOC TW-19 UBZ Top of seal 5998.83 39.61 3 84 4 368,964.85 655,519.33 Top of seal 6.00 above TOC TW-19 UBZ Top of seal 5998.83 58.1 50.50 above TOC TW-19 UBZ Top of seal 5989.37 23 29 8 4 368,964.85 655,519.33 Top of seal 5983.37 38.15 46.4 8 4 368,964.85 655,519.33 Top of seal 5984.52 Top of seal 5984.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal 6.00 above TOC TW-20 UBZ Top of seal 5984.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal 6.00 above TOC TW-20 UBZ Top of seal 5984.47 106.36 114.3 8 4 371,421.83 684,266.62 Top of seal 6.00 above TOC TW-20 UBZ Top of seal 5984.47 108.36 114.3 8 4 371,431.86 64,473.24 Top of seal 5984.47 108.36 114.3 8 4 371,431.86 64,473.24 Top of seal 5984.47 108.36 114.3 8 4 371,431.86 64,473.24 Top of seal 5984.47 108.36 114.3 8 4 371,431.86 64,473.24 Top of seal 5984.47 108.36 114.3 8 4 371,431.86 64,473.24 Top of seal 5984.47 108.36 114.38 8 4 371,431.88 64,473.24 Top of seal 5984.47 108.36 114.38 8 4 371,431.88 64,473.24 Top of seal 5984.47 108.36 114.38 8 4 371,431.88 64,473.24 Top of seal 5984.47 108.36 114.38 8 4 371,431.88 64,473.24 Top of seal 5984.57 114.88 64,674.58 114.88 64,674.58 114.88							_				
TW-12 UBZ Top of seal 5939.22 88.55 103.8 8 4 389.017.37 656.681.35 Top of seal = 0.07 above TOC TW-13 SLZ Top of seal 5988.35 81 96 8 4 374.932.31 658.465.83 TW-14 UBZ Top of PVC casing 5988.59 15.55 20.6 8 4 374.949.49 658.474.42 TW-15 UBZ Top of seal 5998.59 15.55 20.6 8 4 374.949.49 658.474.42 TOp of seal 5998.27 50.39 62.4 8 4 374.947.60 658.454.43 Top of seal -0.04 above TOC TW-15 UBZ Top of seal 5998.39 69.13 78.6 8 4 374.541.55 654.667.41 Top of seal -0.04 above TOC TW-17 UBZ Top of seal 5998.39 98.5 117.5 8 4 374.539.37 654.567.41 Top of seal -0.04 above TOC TW-18 UBZ Top of seal 5996.89 221.75 240.8 8 4 374.520.88 654.567.41 Top of seal -0.04 above TOC TW-18 UBZ Top of seal 5996.89 221.75 240.8 8 4 374.520.88 654.587.13 Top of seal -0.04 above TOC TW-19 UBZ Top of seal 5998.37 38.15 46.4 8 4 368.945.855.519.33 TW-20 UBZ Top of seal 5893.07 23 29 8 4 368.948.85 655.519.33 TW-20 UBZ Top of seal 5893.07 38.15 46.4 8 4 368.975.43 655.503.64 Top of seal 5998.68 105 123 8 4 368.996.43 655.522.89 TW-22 UBZ Top of seal 5994.7 106.36 114.3 8 4 371.421.14 662.80.62 Top of seal 5994.7 106.36 114.3 8 4 371.421.83 654.286.62 Top of seal 5994.52 171 190 8 4 371.421.83 654.286.62 Top of seal 5994.47 76.39 94.3 8 4 371.421.83 654.286.62 Top of seal 5994.47 76.39 94.3 8 4 371.421.83 654.286.62 Top of seal 5994.47 76.39 94.3 8 4 371.421.83 654.286.62 Top of seal 5994.47 76.39 94.3 8 4 371.421.83 654.286.62 Top of seal 5994.47 76.39 94.3 8 4 371.421.83 654.286.62 Top of seal 5994.47 76.39 94.3 8 4 371.421.83 654.286.62 Top of seal 5994.7 76 89 8 4 371.435.86 654.273.24 TOP of seal 5994.7 76 89 8 4 371.435.86 654.273.24 TOP of seal 5994.7 76 899.89 4 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.493.99 145 8 4 375.399.99 145 8 4 375.399.99 145 8 4 375.399.99 145 8 4 375.399.99 145 8 4 375.399.99 145 8 4 375.399.99 145 8 4 375.399.99 145											
TW-13 SLZ Top of seal 5988.35 81 96 8 4 374,932.31 658,465.83 TW-14 UBZ Top of PVC casing 5988.59 15.55 20.6 8 4 374,932.31 658,465.83 TW-14 UBZ Top of Seal 5988.27 50.39 62.4 8 4 374,949.49 658,474.42 TW-15 UBZ Top of seal 5988.27 50.39 62.4 8 4 374,947.60 658,454.43 Top of seal = 0.04 above TOC TW-16 UBZ Top of seal 5998.39 69.13 78.6 8 4 374,541.55 654,567.41 Top of seal = 0.04 above TOC TW-17 UBZ Top of seal 5998.39 99.5 117.5 8 4 374,539.37 654,567.61 Top of seal = 0.04 above TOC TW-17 UBZ Top of seal 5998.89 221.75 240.8 8 4 374,539.37 654,567.61 Top of seal = 0.04 above TOC TW-19 UBZ Top of seal 5998.89 221.75 240.8 8 4 374,520.88 654,567.13 Top of seal = 0.04 above TOC TW-19 UBZ Top of seal 5998.89 221.75 240.8 8 4 368,984.85 655.519.33 Top of seal = 0.04 above TOC TW-19 UBZ Top of seal 5893.07 23 29 8 4 368,984.85 655.519.33 Top of seal = 0.04 above TOC TW-20 UBZ Top of seal 5893.37 38.15 46.4 8 4 368,975.43 655,503.64 Top of seal = 0.05 above TOC TW-21 UBZ Top of seal 5998.47 106.36 114.3 8 4 369,974.43 655,503.64 Top of seal = 0.05 above TOC TW-23 LBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05 above TOC TW-23 LBZ Top of seal 5954.52 171 190 8 4 371,421.83 654,265.62 TW-24 UBZ Top of seal 5994.42 138.99 145 8 4 371,421.83 654,265.62 TW-24 UBZ Top of seal 5994.42 138.99 145 8 4 371,421.83 654,265.62 TW-28 UBZ Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.49 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.49 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.49 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.49 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.49 Top of seal 5989.4 76 89 8 4 375,486.33 654,189.49 Top of seal 5989.4 76 89 8 4 375,487.89 655,789.60 TOP TOP of seal 5989.5 94 26.8 49.7 10 4 375,474.82 654,189.7 10 70 of seal 5989.5 94 26.8 49.7 10 4 375,474.82											
TW-14 UBZ Top of PVC casing 5988.59 15.55 20.6 8 4 374,949.49 658,474.42 TW-15 UBZ Top of seal 5988.27 50.39 62.4 8 4 374,947.60 658,454.43 Top of seal = 0.04' above TOC TW-16 UBZ Top of seal 5998.39 69.13 78.6 8 4 374,947.60 658,454.43 Top of seal = 0.04' above TOC TW-17 UBZ Top of seal 5998.39 98.5 117.5 8 4 374,539.37 654,587.61 Top of seal = 0.04' above TOC TW-18 LBZ Top of seal 5998.33 98.5 117.5 8 4 374,539.37 654,587.61 Top of seal = 0.04' above TOC TW-18 LBZ Top of seal 5998.68 221.75 240.8 8 4 374,539.37 654,587.61 Top of seal = 0.04' above TOC TW-19 UBZ Top of seal 5893.07 23 29 8 4 368,984.85 655,519.33 Top of seal = 0.04' above TOC TW-19 UBZ Top of seal 5893.07 23 29 8 4 368,984.85 655,519.33 Top of seal = 0.04' above TOC TW-21 LBZ Top of seal 5893.37 38.15 46.4 8 4 368,975.43 655,503.64 Top of seal = 0.05' above TOC TW-21 LBZ Top of seal 5954.7 106.36 114.3 8 4 388,999.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-24 UBZ Top of PVC casing 5954.43 75.3 94.3 8 4 371,421.83 654,280.62 Top of seal = 0.05' above TOC TW-28 UBZ Top of seal 5994.42 138.99 145 8 4 371,421.83 654,280.62 Top of seal = 0.05' above TOC TW-28 UBZ Top of seal 5994.42 138.99 145 8 4 371,421.83 654,280.62 Top of seal = 0.05' above TOC TW-29 UBZ Top of seal 5994.4 76 89 8 4 375,486.33 654,187.34 Top of seal = 0.05' above TOC TW-30 UBZ Top of seal 5998.4 76 89 8 4 375,486.33 654,187.34 Top of seal = 0.05' above TOC TW-30 UBZ Top of seal 5995.68 69.11 77.1 8 4 372,539.63 657,699.62 Top of seal = 0.02' above TOC TW-31 UBZ Top of seal 5995.68 69.11 77.1 8 4 372,539.69 657,709.67 Top of seal = 0.02' above TOC TW-31 UBZ Top of seal 5995.68 69.11 77.1 8 4 372,539.69 657,709.67 Top of seal = 0.02' above TOC TW-33 UBZ Top of seal 5995.68 69.11 77.1 8 4 372,539.69 657,709.67 Top of seal = 0.02' above TOC TW-33 UBZ Top of seal 5897.07 50.57 58.1 8 4 389,339.1 655,570.90 Top of seal = 0.03' above TOC TW-37 UBZ Top of seal 5897.07 50.57 58.1 8 4 399,339.1 655,570.90 Top of seal								1	,		Top of seal = 0.07' above TOC
TW-15 UBZ Top of seal 5988.27 50.39 62.4 8 4 374,947.60 658,454.43 Top of seal = 0.04' above TOC TW-16 UBZ Top of seal 5998.39 69.13 78.6 8 4 374,541.55 654,567.41 Top of seal = 0.04' above TOC TW-17 UBZ Top of seal 5998.39 69.13 78.6 8 4 374,541.55 654,567.41 Top of seal = 0.04' above TOC TW-17 UBZ Top of seal 5998.33 98.5 117.5 8 4 374,539.37 654,587.61 Top of seal = 0.04' above TOC TW-18 LBZ Top of seal 5998.89 221.75 240.8 8 4 374,520.88 654,587.13 Top of seal = 0.04' above TOC TW-19 UBZ Top of PVC casing 5893.07 23 29 8 4 368,984.85 655,519.33 Top of seal = 0.04' above TOC TW-19 UBZ Top of seal 5893.37 38.15 46.4 8 4 368,975.43 655,503.64 Top of seal = 0.05' above TOC TW-21 LBZ Top of seal 5893.37 38.15 46.4 8 4 368,975.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-24 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-26 UBZ Top of seal 5954.43 75.3 94.3 8 4 371,435.86 654,273.24 TW-26 UBZ Top of seal 5994.4 76 89 8 4 372,217.87 655,264.83 Top of seal = 0.04' above TOC TW-29 UBZ Top of seal 5999.42 138.99 145 8 4 372,417.87 655,264.83 Top of seal = 0.05' above TOC TW-30 UBZ Top of seal 5999.42 138.99 145 8 4 372,417.82 654,187.34 Top of coupling 5992.73 64.69 71.7 8 4 375,546.33 654,187.34 Top of coupling 5992.73 64.69 71.7 8 4 375,546.39 657,799.67 TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 372,539.63 657,698.2 TOP of coupling 5995.91 151 181 8 4 372,539.63 657,698.2 TOP of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5995.91 151 181 8 4 372,539.63 657,698.2 TOP of seal = 0.07' above TOC TW-34 UBZ Top of seal 5897.07 50.57 5.8 6 89.11 77.1 8 4 372,539.63 657,698.2 TOP of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5995.91 151 181 8 4 372,539.63 657,698.2 TOP of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5995.91 151 181 8 4 372,539.63 657,698.2 TOP of seal = 0.07' above TOC TW-34 UBZ Top of seal 5897.07 50.57 50.57 58.1 8 4 369.33.9 655,677.99 TOP of seal = 0.07' above TOC T							8	4	374,932.31	658,465.83	
TW-16 UBZ Top of seal 5998.39 69.13 78.6 8 4 374,541.55 654,567.41 Top of seal = 0.04' above TOC TW-17 UBZ Top of seal 5998.33 98.5 117.5 8 4 374,593.37 654,587.61 Top of seal = 0.04' above TOC TW-18 LBZ Top of seal 5996.89 221.75 240.8 8 4 374,520.88 654,587.13 Top of seal = 0.04' above TOC TW-19 UBZ Top of seal 5996.89 221.75 240.8 8 4 368,984.85 655,571.33 Top of seal = 0.04' above TOC TW-19 UBZ Top of seal 5996.89 221.75 240.8 8 4 368,984.85 655,571.33 Top of seal = 0.04' above TOC TW-19 UBZ Top of seal 5996.89 .21 3 8 4 368,984.85 655,519.33 TW-20 UBZ Top of seal 5983.37 38.15 46.4 8 4 368,984.85 655,528.89 TW-21 UBZ Top of seal 5984.7 106.36 114.3 8 4 368,980.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal 5954.7 106.36 114.3 8 4 371,421.83 654,265.62 TOP of seal 5954.7 106.36 114.3 8 4 371,421.83 654,265.62 TOP of seal 5994.42 138.99 145 8 4 372,217.87 655,264.35 Top of seal 5991.42 138.99 145 8 4 372,217.87 655,264.35 Top of seal 5999.4 76 89 8 8 4 375,486.33 654,187.34 Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling 5982.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling 5992.73 64.69 71.7 8 4 372,539.79 657,709.67 TW-32 UBZ Top of coupling 5992.73 64.69 71.7 8 4 372,539.79 657,709.67 TW-33 UBZ Top of coupling 5975.29 22 31 8 4 372,539.79 657,709.67 TW-33 UBZ Top of coupling 5975.91 151 181 8 4 372,539.79 657,709.67 TW-33 UBZ Top of coupling 5975.91 151 181 8 4 372,539.59 657,696.82 Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 5897.16 73.53 86 8 4 372,837.18 654,245.63 Top of seal 6.0.07 above TOC TW-37 UBZ Top of coupling 5975.91 151 181 8 4 372,539.79 657,709.67 TW-33 UBZ Top of seal 5897.16 73.53 86 8 8 4 369,036.29 655,076.56 Top of seal 6.0.07 above TOC TW-37 UBZ Top of seal 5897.16 73.53 86 8 8 4 369,036.29 655,076.56 Top of seal 6.0.07 above TOC TW-37 UBZ Top of seal 5897.16 73.53 86 8 8 4 369,036.29 655,076.56 Top of seal 6.0.07 above TOC	TW-14	UBZ	Top of PVC casing	5988.59	15.55	20.6	8	4	374,949.49	658,474.42	
TW-17 UBZ Top of seal 5998.33 98.5 117.5 8 4 374,539.37 654,587.61 Top of seal = 0.04' above TOC TW-18 LBZ Top of seal 5996.89 221.75 240.8 8 4 374,520.88 654,587.13 Top of seal = 0.04' above TOC TW-19 UBZ Top of PVC casing 5893.07 23 29 8 4 368,984.85 655,519.33 TW-20 UBZ Top of seal 5893.37 38.15 46.4 8 4 368,984.85 655,519.33 TW-21 LBZ Top of seal 5893.37 38.15 46.4 8 4 368,969.43 655,519.33 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 368,969.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-21 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.83 654,265.62 TOP of seal = 0.05' above TOC TW-24 UBZ Top of seal 5954.43 75.3 94.3 8 4 371,421.83 654,265.62 TOP of seal = 0.04' above TOC TW-26 UBZ Top of seal 5991.42 138.99 145 8 4 371,435.86 654,273.24 TW-26 UBZ Top of seal 5991.42 138.99 145 8 4 372,217.87 655,264.35 Top of seal 0.04' above TOC TW-29 UBZ Top of seal 5998.4 76 89 8 4 375,471.82 654,187.34 Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling 5987.59 12 2 31 8 4 372,539.63 657,709.67 TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling 0.25' above TOC TW-30 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,539.69 657,696.82 TOP of seal 0.02' above TOC TW-30 UBZ Top of seal 5897.16 77.5 8 4 372,539.69 657,696.82 TOP of seal 0.07' above TOC TW-30 UBZ Top of seal 5897.16 73.53 86 89.1 77.1 8 4 372,539.69 657,696.82 TOP of seal 0.07' above TOC TW-30 UBZ Top of seal 5897.16 73.53 86 89.1 77.1 8 4 372,539.69 657,696.82 TOP of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-36 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-36 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-38 UBZ Top of seal 5897.07 50.57 58.1 8 4 373,1350.554 655,697.89 Top of seal 0.03' above TOC TW-39 UBZ Top of	TW-15	UBZ	Top of seal	5988.27	50.39	62.4	8	4	374,947.60	658,454.43	Top of seal = 0.04' above TOC
TW-18	TW-16	UBZ	Top of seal	5998.39	69.13	78.6	8	4	374,541.55	654,567.41	Top of seal = 0.04' above TOC
TW-19 UBZ Top of PVC casing 5893.07 23 29 8 4 368,984.85 655,519.33 TW-20 UBZ Top of seal 5893.37 38.15 46.4 8 4 368,975.43 655,503.64 Top of seal = 0.05' above TOC TW-21 LBZ Top of coupling 5893.68 105 123 8 4 368,969.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.44 654,280.62 Top of seal = 0.05' above TOC TW-23 LBZ Top of seal 5954.52 171 190 8 4 371,421.83 654,280.62 Top of seal = 0.05' above TOC TW-24 UBZ Top of PVC casing 5954.43 75.3 94.3 8 4 371,421.83 654,265.62 Top of seal 5991.42 138.99 145 8 4 372,213.87 655,264.35 Top of seal = 0.04' above TOC TW-28 UBZ Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 TW-29 UBZ Top of coupling 5989.59 42.68 49.7 10 4 375,471.62 654,187.34 Top of coupling 5989.59 42.68 49.7 10 4 375,471.62 654,187.34 Top of coupling 0.25' above TO TW-31 UBZ Top of coupling 5975.29 22 31 8 4 372,539.79 657,794.07 Top of coupling 0.25' above TO TW-34 UBZ Top of coupling 5975.91 151 181 8 4 372,539.89 657,696.82 Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling 0.27' above TOC TW-35 UBZ Top of seal 5897.16 73.55 86 8 4 369,362.9 657,696.82 Top of seal = 0.07' above TOC TW-36 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,93.91 655,496.74 Top of coupling 0.27' above TOC TW-35 UBZ Top of seal 5897.16 73.55 86 8 4 369,362.9 657,696.82 Top of seal = 0.07' above TOC TW-35 UBZ Top of seal 5897.16 73.55 86 8 4 369,362.9 657,698.47 Top of seal = 0.07' above TOC TW-36 UBZ Top of seal 5897.16 73.55 86 8 4 369,362.9 657,698.47 Top of seal = 0.07' above TOC TW-36 UBZ Top of seal 5897.16 73.55 86 8 4 369,363.99 655,061.98 Top of seal = 0.04' above TOC TW-39 UBZ Top of seal 5897.16 73.55 86 8 4 369,363.99 655,061.98 Top of seal = 0.04' above TOC TW-39 UBZ Top of seal 5897.07 50.57 56.1 8 4 369,363.99 655,061.98 Top of seal = 0.04' above TOC TW-39 UBZ Top of seal 5897.07 50.57 56.1 8 4 369,363.99 655,061.98 Top of seal = 0.04' above TOC TW-39 UBZ Top o	TW-17	UBZ	Top of seal	5998.33	98.5	117.5	8	4	374,539.37	654,587.61	Top of seal = 0.04' above TOC
TW-20 UBZ Top of seal 5893.37 38.15 46.4 8 4 368,975.43 655,503.64 Top of seal = 0.05' above TOC TW-21 LBZ Top of coupling 5893.68 105 123 8 4 368,969.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-24 UBZ Top of seal 5954.52 171 190 8 4 371,421.83 654,265.62 TOP of seal 5954.52 171 190 8 4 371,421.83 654,265.62 TOP of seal 5954.52 171 190 8 4 371,421.83 654,265.62 TOP of seal 5991.42 138.99 145 8 4 372,217.87 655,264.35 TOP of seal = 0.04' above TOC TW-28 UBZ Top of seal 5991.42 138.99 145 8 4 375,486.33 654,189.48 TW-29 UBZ Top of seal 5999.4 76 89 8 4 375,486.33 654,189.48 TW-29 UBZ Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling 5980.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling = 0.25' above TO TW-30 UBZ Top of polying 5975.29 22 31 8 4 372,539.79 657,799.67 TW-31 UBZ Top of coupling 5975.29 22 31 8 4 372,539.79 657,799.67 TW-33 UBZ Top of seal 5897.16 151 181 8 4 372,539.63 657,696.82 TW-33 UBZ Top of seal 5897.16 69.11 77.1 8 4 372,539.63 657,696.82 TW-33 UBZ Top of seal 5897.69 5975.91 151 181 8 4 372,539.63 657,696.82 TW-34 UBZ Top of coupling 5985.76 69.11 77.1 8 4 389.99.91 655,496.74 Top of seal = 0.07' above TOC TW-34 UBZ Top of seal 5897.16 73.53 86 8 4 389.393.91 655,496.74 Top of seal = 0.07' above TOC TW-37 UBZ Top of seal 5897.16 73.53 86 8 4 372,837.18 654,245.63 Top of seal = 0.07' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of seal 5897.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 70.9 8 4 373,505.54 655,691.80 Top of seal = 0.03' above TOC TW-38 UBZ Top of seal 5897.07 50.57 58.1 8 4 373,505.54 655,691.80 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5999.91 3599.07 79.16 91.2 8 4 373,505.54 655,697.28 Pump out of well	TW-18	LBZ	Top of seal	5996.89	221.75	240.8	8	4	374,520.88	654,587.13	Top of seal = 0.04' above TOC
TW-21 LBZ Top of coupling 5893.68 105 123 8 4 368,969.43 655,528.89 TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-23 LBZ Top of PVC casing 5954.52 171 190 8 4 371,421.83 654,280.62 Top of seal 5954.43 75.3 94.3 8 4 371,421.83 654,280.62 Description 4 271,421.83 654,280.62 Top of seal 5995.44 75.3 94.3 8 4 371,421.83 654,2873.24 4 4 70.7 8 4 372,217.87 655,264.35 Top of seal 5991.42 138.99 145 8 4 375,486.33 654,187.34 Top of seal = 0.04' above TOC 70.7 8.9 8 4 375,486.33 654,187.34 Top of seal = 0.04' above TOC 70.7 70.7 8 4 373,594.42 655,794.00 70.9	TW-19	UBZ	Top of PVC casing	5893.07	23	29	8	4	368,984.85	655,519.33	
TW-22 UBZ Top of seal 5954.7 106.36 114.3 8 4 371,421.14 654,280.62 Top of seal = 0.05' above TOC TW-23 LBZ Top of seal 5954.52 171 190 8 4 371,421.83 664,285.62 Top of seal 5954.43 75.3 94.3 8 4 371,435.86 654,273.24 652,273.24 Top of seal 5991.42 138.99 145 8 4 372,217.87 655,264.35 Top of seal = 0.04' above TOC TW-28 UBZ Top of seal 5994.4 76 89 8 4 375,486.33 654,189.48 Top of seal = 0.04' above TOC TW-29 UBZ Top of coupling 5998.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling = 0.27' above TO TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 372,539.63 654,187.34 Top of coupling = 0.25' above TO TW-30 UBZ Top of coupling 5995.79 22 31 8 4 372,539.63	TW-20	UBZ	Top of seal	5893.37	38.15	46.4	8	4	368,975.43	655,503.64	Top of seal = 0.05' above TOC
TW-23 LBZ Top of seal 5954.52 171 190 8 4 371,421.83 654,265.62 TW-24 UBZ Top of PVC casing 5954.43 75.3 94.3 8 4 371,435.86 654,273.24 TW-26 UBZ Top of seal 5991.42 138.99 145 8 4 372,217.87 655,664.35 Top of seal = 0.04' above TOC TW-28 UBZ Top of seal 5999.4 76 89 8 4 375,486.33 654,189.48 TW-29 UBZ Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling 0.27' above TOC TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling 0.25' above TOC TW-31 UBZ Top of coupling 5975.29 22 31 8 4 372,539.79 657,709.67 TW-32 LBZ Top of coupling 5975.91 151 181 8 4 372,539.63 657,696.82 TW-33 UBZ Top of coupling 5975.88 69.11 77.1 8 4 372,539.63 657,696.82 TW-34 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 657,699.47 Top of coupling 0.27' above TOC TW-37 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.07' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal 0.03' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 372,837.18 654,245.63 Top of seal 0.03' above TOC TW-38 UBZ Top of seal 5897.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal 0.03' above TOC TW-38 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.29 655,076.56 Top of seal 0.03' above TOC TW-40 UBZ Top of seal 5897.07 50.57 58.1 8 4 373,122.39 655,757.09 TW-41 UBZ Top of PVC casing 598.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of PVC casing 598.94 84.32 91.3 8 4 373,178.57 655,840.05 Top of seal 0.04' above TOC TW-42 UBZ Top of PVC casing 598.98 82.38 91.4 8 4 373,178.57 655,840.05 Top of seal 0.04' above TOC TW-43 UBZ Top of PVC casing 598.98 82.38 91.4 8 4 373,178.57 655,840.05 Top of seal 0.04' above TOC TW-43 UBZ Top of PVC casing 598.98 82.38 91.4 8 4 373,178.57 655,840.05 Top of seal 0.04' above TOC TW-43 UBZ Top of PVC casing 598.98 82.38 91.4 8	TW-21	LBZ	Top of coupling	5893.68	105	123	8	4	368,969.43	655,528.89	
TW-24 UBZ Top of PVC casing 5954.43 75.3 94.3 8 4 371,435.86 654,273.24 TW-26 UBZ Top of seal 5991.42 138.99 145 8 4 372,217.87 655,264.35 Top of seal = 0.04' above TOC TW-28 UBZ Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling = 0.27' above TOC TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling = 0.25' above TOC TW-31 UBZ Top of coupling 5975.29 22 31 8 4 372,539.79 657,709.67 TW-32 LBZ Top of coupling 5975.91 151 181 8 4 372,539.79 657,709.67 TW-33 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,539.63 657,696.82 657,699.47 Top of seal = 0.07' above TOC TW-34 UBZ Top of seal 5897.16 73.53 86 8 4 368,993.91 655,496.74 Top of seal = 0.02' above TOC TW-37 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.03' above TOC TW-38 UBZ Top of seal 5897.16 73.53 86 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.03' above TOC TW-40 UBZ Top of Seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-41 UBZ Top of PVC casing 5999.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of PVC casing 5999.91 5994.31 57.86 70.9 8 4 373,178.57 655,840.05 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5999.07 79.16 91.2 8 4 373,178.57 655,840.05 Pump out of well	TW-22	UBZ	Top of seal	5954.7	106.36	114.3	8	4	371,421.14	654,280.62	Top of seal = 0.05' above TOC
TW-26 UBZ Top of seal 5991.42 138.99 145 8 4 372,217.87 655,264.35 Top of seal = 0.04' above TOC TW-28 UBZ Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 10 10 4 375,471.62 654,187.34 10 10 10 4 375,471.62 654,187.34 10 10 10 4 375,471.62 654,187.34 10 </td <td>TW-23</td> <td>LBZ</td> <td>Top of seal</td> <td>5954.52</td> <td>171</td> <td>190</td> <td>8</td> <td>4</td> <td>371,421.83</td> <td>654,265.62</td> <td></td>	TW-23	LBZ	Top of seal	5954.52	171	190	8	4	371,421.83	654,265.62	
TW-28 UBZ Top of seal 5989.4 76 89 8 4 375,486.33 654,189.48 Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling = 0.27' above TO TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling = 0.25' above TO TW-31 UBZ Top of PVC casing 5975.29 22 31 8 4 372,539.69 657,709.67 TW-32 LBZ Top of coupling 5975.29 151 181 8 4 372,539.63 657,696.82 TW-33 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,539.63 657,699.47 Top of seal = 0.07' above TOC TW-34 UBZ Top of seal 5897.16 73.53 86 8 4 368,993.91 655,496.74 Top of seal = 0.04' above TOC TW-35 UBZ Top of seal 5897.16	TW-24	UBZ	Top of PVC casing	5954.43	75.3	94.3	8	4	371,435.86	654,273.24	
TW-29 UBZ Top of coupling 5989.59 42.68 49.7 10 4 375,471.82 654,187.34 Top of coupling = 0.27' above TOTW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling = 0.25' above TOTW-31 UBZ Top of PVC casing 5975.29 22 31 8 4 372,539.79 657,709.67 TW-32 LBZ Top of coupling 5975.91 151 181 8 4 372,539.63 657,696.82 TOP of coupling 5975.68 69.11 77.1 8 4 372,526.92 657,699.47 Top of seal = 0.07' above TOCTW-34 UBZ Top of coupling 5983.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling = 0.27' above TOCTW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOCTW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOCTW-38 UBZ Top of Seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOCTW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOCTW-40 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,312.39 655,757.09 TOP of coupling 5994.31 57.86 70.9 8 4 373,318.57 655,621.80 Top of coupling = 0.3' above TOCTW-43 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,697.28 Pump out of well	TW-26	UBZ	Top of seal	5991.42	138.99	145	8	4	372,217.87	655,264.35	Top of seal = 0.04' above TOC
TW-30 UBZ Top of coupling 5992.73 64.69 71.7 8 4 373,594.42 655,794.00 Top of coupling = 0.25' above TO TW-31 UBZ Top of PVC casing 5975.29 22 31 8 4 372,539.79 657,709.67 TW-32 LBZ Top of coupling 5975.91 151 181 8 4 372,539.63 657,696.82 TW-33 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,526.92 657,699.47 Top of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling = 0.27' above TOC TW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5999.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of PVC casing 5999.91 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,141.22 655,697.28 Pump out of well			Top of seal	5989.4			8	4	375,486.33		
TW-31 UBZ Top of PVC casing 5975.29 22 31 8 4 372,539.79 657,709.67 TW-32 LBZ Top of coupling 5975.91 151 181 8 4 372,539.63 657,696.82 TW-33 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,526.92 657,699.47 Top of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling = 0.27' above TOC TW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of seal 5897.91 92.72 104.7 8 4 370,446.40 656,523.94 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of Coupling 5994.31 57.86 70.9 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,141.22 655,697.28 Pump out of well			Top of coupling			-	10	4	375,471.82		Top of coupling = 0.27' above TOC
TW-32 LBZ Top of coupling 5975.91 151 181 8 4 372,539.63 657,696.82 TW-33 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,526.92 657,699.47 Top of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling = 0.27' above TOC TW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>8</td> <td>4</td> <td></td> <td></td> <td>Top of coupling = 0.25' above TOC</td>							8	4			Top of coupling = 0.25' above TOC
TW-33 UBZ Top of coupling 5975.68 69.11 77.1 8 4 372,526.92 657,699.47 Top of seal = 0.07' above TOC TW-34 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling = 0.27' above TOC TW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well								· -			
TW-34 UBZ Top of coupling 5893.43 69.92 76.4 8 4 368,993.91 655,496.74 Top of coupling = 0.27' above TO TW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5980.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5980.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well											
TW-35 UBZ Top of seal 5897.16 73.53 86 8 4 369,036.29 655,076.56 Top of seal = 0.04' above TOC TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 Tup of PVC casing 59							_	· -	- ,		
TW-37 UBZ Top of seal 5959.17 96.32 102.9 8 4 372,837.18 654,245.63 Top of seal = 0.03' above TOC TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well								· -			1 0
TW-38 UBZ Top of PVC casing 5972.91 92.72 104.7 8 4 370,446.40 656,523.94 TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well							_				
TW-39 UBZ Top of seal 5897.07 50.57 58.1 8 4 369,036.99 655,061.98 Top of seal = 0.04' above TOC TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well									- ,		Top of seal = 0.03' above TOC
TW-40 UBZ Top of PVC casing 5989.94 84.32 91.3 8 4 373,122.39 655,757.09 TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well					-				,		
TW-41 UBZ Top of coupling 5994.31 57.86 70.9 8 4 373,505.54 655,621.80 Top of coupling = 0.3' above TOC TW-42 UBZ Top of PVC casing 5990.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well											Top of seal = 0.04' above TOC
TW-42 UBZ Top of PVC casing 599.07 79.16 91.2 8 4 373,178.57 655,840.05 TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well											
TW-43 UBZ Top of PVC casing 5989.08 82.38 91.4 8 4 373,141.22 655,697.28 Pump out of well											Top of coupling = 0.3' above TOC
		_					_				
	TW-43 TW-44A	UBZ LBZ	Top of PVC casing Top of seal	5989.08 5989.41	82.38 131	91.4 150	<u>8</u> 8	4	373,141.22 373,110.02	655,697.28 655,766.66	Pump out of well Top of seal = 0.04' above TOC



April 2010 913-1101.605A Page 2 of 2

Table 4
Monitoring Well Measuring Point Information

Well	Formation	Measuring Point (MP) (per RI Report)	MP Elevation	Top of Monitored Interval (feet bgs)	Bottom of Monitored Interval (feet	Hole Diameter (inches)	Casing Diameter (inches)	SP Northing	SP Easting	Comment
					bgs)		, ,	•		
HARRIS	UBZ	Top of steel 1" pipe	5877.56	58	62	6	6	368,317.90	654,651.32	MP = 4.05' above well-house floor
TW-45	LBZ	Top of coupling	5959.17	216.79	230.8	8	4	372,827.62	654,238.16	Top of coupling = 0.26' above TOC
TW-48	UBZ	Top of coupling	5989.4	67.31	73.3	8	4	375,520.55	655,978.20	Top of coupling = 0.25' above TOC
TW-49	UBZ	Top of seal	5996.94	75.21	84.2	8	4	374,930.77	656,071.52	Top of seal = 0.04' above TOC
TW-50	UBZ	Top of seal	5992.94	73.78	90.8	8	4	373,849.68	656,040.74	Top of seal = 0.04' above TOC
TW-53	UBZ	Top of coupling	5880.65	19.54	34	8	4	368,055.24	654,739.84	Top of coupling = 0.26' above TOC
TW-54	UBZ	Top of coupling	5889.21	39.26	54.3	8	4	368,052.39	655,240.53	Top of coupling = 0.25' above TOC
TW-55	UBZ	Top of coupling	5886.58	53.5	69	8	4	368,050.24	655,739.76	Top of coupling = 0.25' above TOC
TW-56	UBZ	Top of coupling	5910.2	86.8	100.3	8	4	367,979.10	656,276.06	Top of coupling = 0.2' above TOC
TW-57	UBZ	Top of coupling	5952.74	23.18	37.3	8	4	374,365.91	654,000.20	Top of coupling = 0.2' above TOC
TW-58	UBZ	Top of steel casing	5892.74	36.3	51.7	12	8	368,980.16	655,458.20	
TW-59	UBZ	Top of PVC casing	5855.89	29	43	8	4	365,662.80	654,853.50	Top of PVC Casing
TW-60	UBZ	Top of PVC casing	5866.98	43	56.5	8	4	366,126.70	653,945.10	Top of PVC Casing
TW-61	UBZ	Top of PVC casing	5876.17	61.5	74.5	8	4	367,105.20	653,964.70	Top of PVC Casing
TW-62	UBZ	Top of PVC casing	5878.67	46.5	63.5	8	4	366,945.50	655,320.40	Top of PVC Casing
SO2 Landfill North	UBZ	Top of well cap	TBD	68	88	8	4	376,555.90	656,197.96	Not Surveyed
SO2 Landfill South	UBZ	Top of well cap	TBD	60	80	8	4	375,615.53	655,478.55	Not Surveyed

Notes:

TBD: To be determined



Table 5
Sample Collection Summary

	Sampl	е Туре			Pump and				
			Formation		Starter Box	Purge	Filter/	Filter	
Location	Water Quality	Water Level	Monitored	Method	Size	Method	Unfilter	Size	Notes
Surface Water/Non-Contact Cooling Water	,		monitorea	mounea	0.20	mounou	• · · · · · · · · · · · · · · · · · · ·	0.20	110100
Non-Contact Cooling Water 1	Yes	No	NA	Grab	NA	NA	U		
Non-Contact Cooling Water 2	Yes	No	NA NA	Grab	NA NA	NA NA	U		
Non-Contact Cooling Water 3	Yes	No	NA NA	Grab	NA NA	NA NA	U		
PR-1 (Power Return)	Yes	No	NA NA	Grab	NA NA	NA NA	U		Measure flow with Swoffer Current Meter
SC-1 (Soda Up)	Yes	No	NA NA	Grab	NA NA	NA NA	U		Measure flow with Swoffer Current Meter
SC-2 (Soda Weir)	Yes	No	NA NA	Grab	NA	NA	Ü		Measure flow with Swoffer Current Meter
SC-3 (Soda Mid)	Yes	No	NA	Grab	NA NA	NA	Ü		Measure flow with Swoffer Current Meter
SC-4 (Soda Down)	Yes	No	NA	Grab	NA	NA	Ü		Measure flow with Swoffer Current Meter
SC-5 (Soda Below Weir)	Yes	No	NA	Grab	NA	NA	U		Measure flow with Swoffer Current Meter
SC-6 (Soda at Property Line)	Yes	No	NA	Grab	NA	NA	U		Measure flow with Swoffer Current Meter
SC-7 (Soda Upstream of Power Return)	Yes	No	NA	Grab	NA	NA	U		Measure flow with Swoffer Current Meter
SC-8 (Soda Downstream of Power Return)	Yes	No	NA	Grab	NA	NA	U		Measure flow with Swoffer Current Meter
SC-9 (Soda Upstream of Alexander Reservoir)	Yes	No	NA	Grab	NA	NA	U		Measure flow with Swoffer Current Meter
Non-Contact Cooling Water Pond Inlet	Yes	No	NA	Grab	NA	NA	U		Need to have Monsanto unlock gate
Groundwater			·	·	-	•			
Big Spring	Yes	No	NA	Grab	NA	NA	U		Have Monsanto arrange sampling time
									May need to clear away roots and grass prior
Calf Spring	Yes	No	NA	Grab	NA	NA	U		to sampling. Allow water to clear if disturbed
City Park Spring	Yes	No	NA	Grab	NA	NA	U		Have Monsanto arrange sampling time
Harris Well	Yes	Yes	UBZ	Non-dedicated pump	Grundfos	Ground	U		Follow confined space entry procedures
									May need to clear away roots and grass prior
Homestead Spring	Yes	No	NA	Grab	NA	NA	U		to sampling. Allow water to clear if disturbed
									Have Monsanto arrange sampling time. Ask
Lewis Well	Yes	No	UBZ	Lewis Well	Dedicated Pump	Ground	U		permission to get water level
Mormon A Spring	Yes	No	NA	Grab	NA NA	NA	U		Measure flow with pail and stopwatch
Mormon B Spring	Yes	No	NA NA	Grab	NA NA	NA.	U		Measure flow with pail and stopwatch
Mormon C Spring	Yes	No	NA	Grab	NA	NA	Ü		Measure flow with pail and stopwatch
MC-1 (Mormon Creek)	Yes	No	NA	Grab	NA	NA	Ü		Measure flow with floats
									Have Monsanto turn well on as needed - See
PW-01	Yes	No	UBZ,LBZ	Production well	Dedicated Pump	Ground	U		Boiler operator
		-							Have Monsanto turn well on as needed - See
PW-02	Yes	No	UBZ,LBZ	Production well	Dedicated Pump	Ground	U		Boiler operator
PW-03	Yes	No	UBZ,LBZ	Production well	Dedicated Pump	Ground	U		Runs Continuously
PW-04	Yes	No	UBZ,LBZ	Production well	Dedicated Pump	Ground	U		Runs Continuously
SO2 Landfill North	Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Needs starter box, purge at 5-10 gpm
SO2 Landfill South	Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Needs starter box
SW Spring	Yes	No	NA	Grab	NA	NA	U		
TW-07	No	Yes	UBZ	NA	NA	NA	NA		Well blocked with debris, not sampled
TW-08	Yes	Yes	UBZ	Non-dedicated pump	Grundfos	Tank	U		Purge at < 3 gpm
TW-09	No	Yes	LBZ	Dedicated pump	3/4	NA	NA		Not sampled
TW-10	Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		
TW-11	Yes	Yes	LBZ	Dedicated pump	1/2	Tank	U		Collect Duplicate sample
TW-12	Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Collect Spilt Sample
TW-13	No	Yes	SLZ	NA	NA	NA	NA		Not sampled
TW-14	No	Yes	UBZ	NA	NA	NA	NA		Not sampled
TW-15	Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		
									L
TW-16	Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Water level tape can get hung on pump wires
TW-17	Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		
TW-18	Yes	Yes	LBZ	Dedicated pump	3/4	Ground	U		
TW-19	No	Yes	UBZ	NA Dadias (adams)	NA 1/0	NA Tarak	NA		Not sampled
TW-20	Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Collect Duplicate Sample



Table 5
Sample Collection Summary

		Samp	le Туре			Pump and				
				Formation		Starter Box	Purge	Filter/	Filter	
	Location	Water Quality	Water Level	Monitored	Method	Size	Method	Unfilter	Size	Notes
TW-21	Location	No No	Yes	LBZ	NA	NA	NA	NA	Size	Not sampled
TW-21		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Not sampled
TW-23		No	Yes	LBZ	Dedicated pump	3/4	NA	NA		Not sampled
TW-24		Yes	Yes	UBZ	Non-dedicated pump	Grundfos	Ground	U		Not sampled
TW-26		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Purge at 2 to 3 gpm
TW-28		No	Yes	UBZ	Dedicated pump	1/2	NA	NA		Not sampled
TW-29		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Not campied
TW-30		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		
TW-31		No	Yes	UBZ	Non-dedicated pump	NA	NA	NA		
TW-32		No	Yes	LBZ	Dedicated pump	3/4	NA	NA		Not sampled
02					2 odlodiod pamp	σ, .				. tot oumplou
										Purge slowly (< 2-3 gpm) - high turbidity.
TW-33		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Collect Spilt Sample and Duplicate Sample
						-				
TW-34		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Purge slowly (~1 gpm)- low water production
TW-35		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Collect Spilt Sample
TW-37		Yes	Yes	UBZ	Dedicated pump	3/4	Tank	U		·
TW-38		Yes	Yes	UBZ	Non-dedicated pump	Grundfos	Tank	U		Purge at < 2.5 gpm
TW-39		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		3.
TW-40		Yes	Yes	UBZ	Bailer	NA	Tank	F	0.45 µm	Sample with dedicated bailer
TW-41		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	J		
TW-42		No	Yes	UBZ	NA	NA	NA	NA		Not sampled
TW-43		Yes	Yes	UBZ	Bailer	NA	Tank	F	0.45 µm	Sample with dedicated bailer
										Purge at 1/2 gallons per minute - turbidity
TW-44		Yes	Yes	LBZ	Dedicated pump	3/4	Tank	U		and low water production.
TW-45		Yes	Yes	LBZ	Dedicated pump	3/4	Tank	U		
TW-48		Yes	Yes	UBZ	Dedicated pump	Old	Ground	U		
TW-49		Yes	Yes	UBZ	Dedicated pump	Old	Ground	U		
TW-50		Yes	Yes	UBZ	Dedicated pump	Old	Tank	U		
TW-53		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	כ		4-wire plug into generator
										4-wire plug into generator, Collect Duplicate
TW-54		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Sample
										4-wire plug into generator, Collect Split
TW-55		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		Sample
										4-wire plug into generator, thottle pump to
TW-56		Yes	Yes	UBZ	Dedicated pump	1/2	Tank	U		prevent pumping dry - 2 gpm
TW-57		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		4-wire plug into generator
TW-58		No	Yes	UBZ	NA	NA	NA	NA		
			.,							
TW-59		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Purge at 5 gpm. 4-wire plug into generator
T. // 00			.,			4 /-				
TW-60		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Purge at 5 gpm. 4-wire plug into generator
			.,							4-wire plug into generator, Collect Split
TW-61		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Sample
TW 60		V	V	1157	Dadiest decem	4/0	0	, ,		4-wire plug into generator, Collect Duplicate
TW-62		Yes	Yes	UBZ	Dedicated pump	1/2	Ground	U		Sample
QA/QC				Т	1		T			le : 51 1 %
D :: D: :						.				Equip. Blank (for non-dedicated bailers if
Bailer Blank		Yes	No	NA NA	Grab	NA NA	NA	U		used)
DI Blank		Yes	No	NA	Grab	NA NA	NA	U		Blank
Grundfos Blank Notes:		Yes	No	NA	Grab	NA	NA	U		Equipment Blank

Notes:

UBZ: Upper Basalt Zone

LBZ: Lower Basalt Zone

SLZ: Salt Lake Zone

U: Unfiltered

F: Filtered

NA: Not Applicable

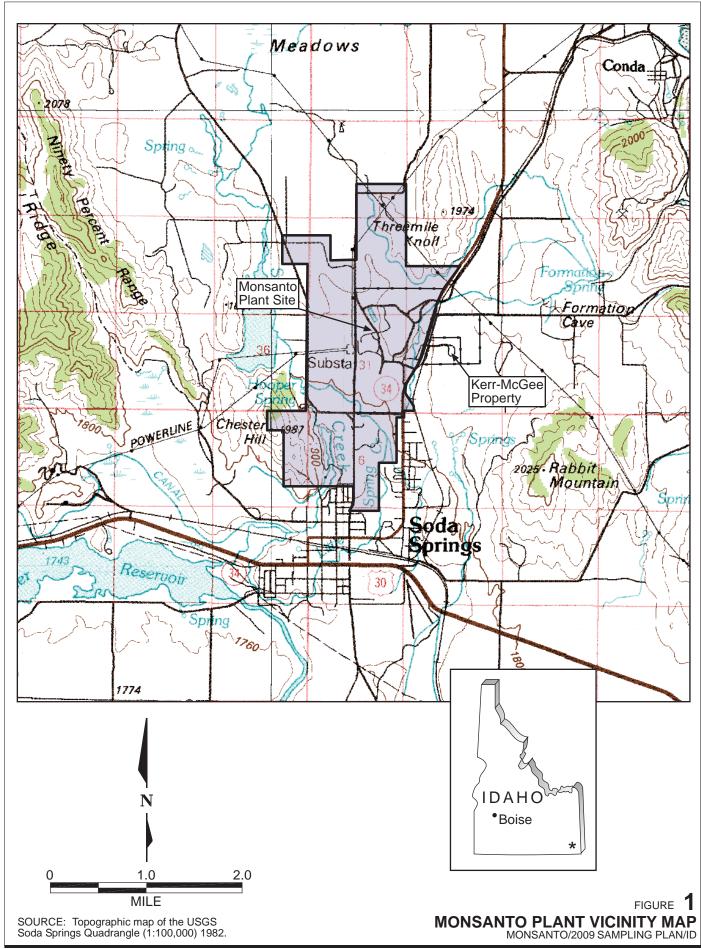


April 2010 913-1101.605A

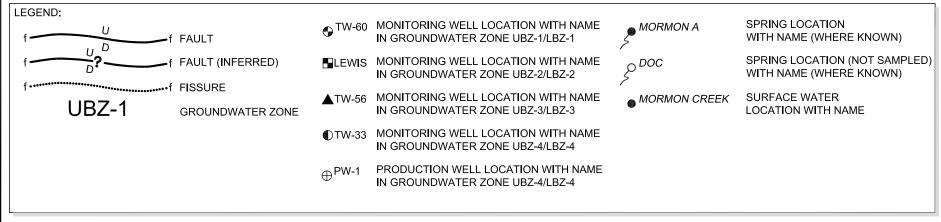
Table 6
Field Parameter Stabilization Criteria

Parameter	Units	Stabilization Criteria	Notes
рН	s.u.	+/- 0.1 s.u.	
Specific Conductance	μS/cm	within 10%	
			> 5 NTU minimum,
Turbidity	NTU	within 10%	>1 NTU preferred
Dissolved Oxygen	mg/L	within 10%	
Temperature	Degrees C	+/- 0.5 °C	









SOURCE: AERIAL PHOTO FROM MONSANTO (5/2/2003). SITE TOPOGRAPHY FROM AERIAL MAPPING, INC., IDAHO (5/11/1996). FIGURE 2
LOCATION OF WELLS AND SPRINGS
MONSANTO/2010 SAMPLING PLAN/ID





APPENDIX A HEALTH AND SAFETY PLAN



April 2010

This Site-Specific Health and Safety Plan is a supplement to Golder's Health and Safety Orientation Manual and Injury and Illness Prevention Program.

	onsanto Soda Springs Plant oundwater	Project #: 913-1101.605A	
Location of Project:	Soda Springs, Idaho	Date: April 30, 2010	
Golder Subcontract	or on Project? Yes No	_	
Project Start Date:	Ongoing	Expected Project Duration:	Ongoing
Health & Safety Coordinator	Amanda Cote	_	
	Name	Signature	Date
Project Manager:	David Banton		
	Name	Signature	Date
Project Director:	David Banton		
	Name	Signature	Date

This signature indicates that the above project manager and project director are aware of the potential hazards at this site, has reviewed this Plan, and will communicate these hazards and appropriate controls to Golder staff prior to their deployment on site.

There are three major categories of emergencies that could occur during any project:

- Illness and/or physical injury;
- Catastrophic event (fire, explosion, earthquake, chemical, or radioactive); and
- Safety equipment failure.

Although a catastrophic event, severe medical emergency, or safety equipment failure are unlikely to occur during work activity at the Site, an emergency action plan is outlined below.



EMERGENCY ACTION PLAN Emergency Contact & Services

T'11 -	M	0 4 4 - 441 -	
Title	Name	Contact #'s	
Site Safety	Michael Klisch	(425) 883-0777	
Officer	WIIGHACI KIISCH	(206) 419-4366	
First Aid/CPR	Golder Field Staff Monsanto Plant EMTs	777 in Plant (Plant phone only) 911 outside Plant	
Project Manager	David Banton	(425) 883-0777 (425) 503-9331	
Office H&S Coordinator	Amanda Cote	(425) 883-0777 (425) 417-2218	
Client Contact	Bob Geddes	(208) 547-1234 (208) 221-6523	
	Jim McCullough	(208) 547-4300	

Title	Name	Contact #'s
Hospital	Caribou Memorial Hospital	(208) 547-3341
Fire Dept.	Monsanto Plant Soda Springs FD	777 in Plant (Plant phone only) 911 outside Plant
Ambulance	Monsanto Plant Soda Springs FD	777 in Plant (Plant phone only) 911 outside Plant
Golder National H&S Leader	Jane Mills	206-295-7002 cell
Injury Intervention Support	WorkCare	888-449-7787

Catastrophic Event or other Emergencies Requiring Evacuation:

In the event of a catastrophic event such as fire or explosion, if the situation can be readily controlled with available resources without jeopardizing your health and safety or the health and safety of others, take immediate action to do so, otherwise follow these steps:

- 1. Notify Emergency Personnel by calling: In Plant 777 from Plant Phones, Outside Plant 911
- 2. Isolate the fire to prevent spread.
- 3. Evacuate the area.
- 4. Assemble at the Muster Station: Main Security Building at Plant Entrance
- 5. Perform head count to ensure complete evacuation.
- 6. Inform Emergency Personnel of any missing team members.
- 7. In the event of an international security emergency, contact Medex at 800-527-0218 (US and Canada) or 410-453-6330 (collect outside of the US).

First Aid Resources

Method of communication	Cell phones and in-Plant phones found in most buildings onsite
Channel or phone number	In Plant – 777 from Plant Phones, 911 Outside Plant
Location of First Aid at the project	Golder Field Vehicle, Monsanto Dispensary in Administration Building



April 2010

site	
Location of nearest telephone if outside assistance is required	Monsanto Plant Phones in Buildings, Golder Cell Phones
Emergency Alert System	Monsanto Plant Siren (note: tested at noon on Fridays)

Medical Emergencies

Medical emergencies can be described as situations that present a significant threat to the health of individual personnel. These can result from a variety of hazardous incidents including chemical and radioactive exposures, heat stress, cold stress, poisonous insect or snakebites, and accidents involving vehicles or heavy equipment. In the event of a medical emergency, implement the following guidelines:

- 8. Assure that the environment is safe;
- 9. Administer appropriate emergency first aid to all injured individuals, only if it is safe to do so, and only by a qualified individual trained in first aid;
- 10. Notify emergency personnel and follow their instructions;
- 11. If emergency personnel cannot be contacted, severely injured personnel shall be transported to the designated hospital/ trauma center identified on the following page.
- 12. Contact WorkCare at the earliest possible time to report the work-related injury. 888-449-7787
- 13. If the project location is outside of the United States and medical assistance is necessary, contact the HTH Assistance Center at 1-888-243-2358 or collect 1-610-254-8769.

April 2010

NEAREST HOSPITAL INFORMATION AND DIRECTIONS

Name: Caribou Memorial Hospital Phone Number: (208) 547-3341

Address: 300 South 3rd West St, Soda Springs ID

Emergency Room: Yes ⊠ or No □

Map to Hospital



Directions from Site

- 1. Right (south) out of Plant onto Highway 34.
- 2. South on Highway 34 to South 3rd West Street (traffic light).
- 3. Left (south) on South 3rd West Street to Highway 30 (traffic light).
- 4. Right (west) on Highway 30 (East 2nd Street South).
- 5. Left (south) onto South 3rd West Street. Hospital is one block south, right (west)side of street

Distance from Site: 3.6 miles Approx. travel time from Site: 7 Minutes



PRE - DEPARTURE

IMPORTANT THINGS TO CHECK & REMEMBER

- 1. Ensure that the Project Manager, Health and Safety Coordinator, and Project Director have approved this HASP.
- 2. Ensure that your Project Manager, Site Safety Officer or Health and Safety Coordinator has discussed the contents of the HASP in detail, gone through the Hazard Assessment with you and explained the hazards associated with the work that you will be performing.
- 3. Ensure that you have all the required PPE and are trained in the areas which are indicated in this HASP.
- 4. Familiarize yourself with the Emergency Action Plan for the site prior to site arrival.
- 5. Check the weather in the immediate area of the project site to ensure that the current weather conditions do not create additional hazards that have not been evaluated.
- 6. Inquire about cell phone coverage (satellite communications may be the ONLY option in some locations) and physically test all of your means of communication to ensure that they function, and you are familiar with the controls.
- 7. If you are going to a site where activities are in progress, do not begin work until you have been given an orientation from the Site Safety Officer and have reviewed any existing Site Health & Safety Manual.
- 8. Review subcontractor's site-specific HASP, as applicable.
- 9. You have the right to refuse any work that you feel is unsafe, or that you are not trained to do. Please discuss your concerns immediately with the Project Manager, Site Safety Officer and Health and Safety Coordinator.

GOLDER ASSOCIATES INC.



FIELDWORK HEALTH & SAFETY PLAN

Project Personnel							
Team	Franctica	Call Dia #	Other Die #	Allonoise	Emergency Contact		Init.*
Member	Function	Cell Ph. #	Other Ph. #	Allergies	Name	Phone #	
David Banton	Project	(425) 503-	(425) 883-	None	Chantal	(425) 788-	
	Manager	9331	0777 (office)		Garceau	8643	
Michael Klisch	Field Team	(206) 419-	(425) 883-	None	Melody	(425) 844-	
	Leader	4366	0777 (office)		Clark	9062 (h)	
						(425) 747-	
						8661 (w)	
						(206) 419-	
						3761 (c)	
Derek Holom	Field	(206) 941-	(425) 883-	None	Lynn	208-771-	
	Hydrogeologist	4973	0777 (office)		Holom	1168	
	/Sampler						

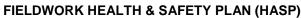
*All Golder Project Personnel must initial in this column beside their name to indicate that they have read & understood the project Health & Safety Plan Special Instructions

1.	Must determine additional H&S requirements from Monsanto Personnel prior to starting work – in site orientation.
2.	Must attend Monsanto Health and Safety Orientation at start of work and pass exam.
3.	Will be accompanied onsite and possibly offsite most of the time by a Monsanto representative.
4.	Must follow all Monsanto H and S guidelines while traveling and working inside and outside of Plant (see Attachment C).
5.	Must follow confined space entry procedures for sampling at Harris Well
6.	Jewelry (rings, bracelets, etc). are not allowed to be worn while working at the Monsanto Plant site, including offsite areas. Medic alert bracelets are the only exception.

Project-Specific Check-in Procedure

If you are in the field alone, or if you are the only Golder person on-site, you <u>must</u> check in with the PM or a designee a minimum of twice each day, preferably once in the mid-morning and once in the mid -afternoon. Document check-in times below and add any relevant notes.

- A.M. Time: 7 AM Pacific Time Notes: Golder personnel check in at site security and with Monsanto site representative.
- P.M. Time: 5 PM Pacific Time Notes: Golder personnel will check in with the Golder PM. Field personnel need to maintain a record of their calls to their PM in their field notebook.





If check-in does not occur at the pre-scheduled time, the PM will follow these steps:

- 1. Call field personnel cell phone or satellite phone to make contact.
- 2. Call cell phone or satellite phone of other colleagues on the project site.
- 3. Call client contact if present on site.
- 4. Call field personnel hotel or home telephone number.
- 5. Call emergency search services.



PROJECT-SPECIFIC HAZARD ASSESSMENT

Date:	April 9, 2010
Assessment Conducted By:	Michael Klisch
Project Location:	Soda Springs, Idaho
Description of Site:	The Monsanto Soda Springs Plant produces elemental phosphorus from phosphate ore, quartzite, and coke. The Plant site consists of offices and warehouses, the furnace and associated ore processing facilities, and material and byproduct stockpiles. Groundwater contamination in and around the plant area was first observed in the early 1980's. The source areas were closed and capped in the mid to late 1980's. Annual groundwater sampling was started in the mid 1980's and continues today. The groundwater in and around the Plant area is affected by slightly elevated concentrations of some metals, chloride, nitrate, fluoride, and sulfate. The concentrations of the constituents of concern have declined since the source areas were closed. The current groundwater concentrations are generally stable or decreasing, and below the remedial goals (drinking water standards) except in the former source areas and in the downgradient area south of the south Plant Fenceline.
Work to be Accomplished	The current work consists of water quality sampling at approximately 65 to 70 monitoring wells, Plant production wells, springs, and surface water sampling locations, and measurement of flow at the surface water and spring sites. The monitoring wells and production wells are located on the inside the Plant site, on perimeter of the Plant site, and outside of the Plant Fenceline. The springs and surface water sites are located outside of the Plant Fenceline. Golder personnel will generally be escorted by a Monsanto representative while working on the Plant site and possibly while working offsite.

For each general category of hazard identified below, all project-specific hazards/conditions must be defined, and the control measures for each hazard must be identified.

Examp	ole:
-------	------

Slips,Trip / Fall Hazards		Site contains uneven and broken surfaces, especially the eastern wooded portion along the Black River.	footwear (leather boots) that provides	X Slips, Trips and Falls
---------------------------	--	--	--	--------------------------

Hazard	Identification of Project-Specific Conditions		Necessary Controls	Standard Work Procedure Attached (see Appendix B)
Travel to site				
Aircraft	\boxtimes	Commercial air service to Idaho Falls or Salt Lake City	Office and PM have copy of flight details	
Helicopter				
Boat				☐Working on or over water
Public or Private Roads/Driving		Driving to and from site and driving onsite	Seat belts, follow all Monsanto driving policies (headlights, speed limits), vehicle inspections	
All Terrain Vehicles				☐All Terrain Vehicle



April 201						
Hazard	Identification of Project-Specific Conditions		Necessary Controls	Standard Work Procedure Attached (see Appendix B)		
				Safety		
Snowmobiles				☐Snowmobile Safety		
Other						
Site Terrain/Conditions						
Shafts/Trenches/Slopes				☐Trenching and Shoring		
Overhead Hazards				Overhead Hazards		
High Altitude Location						
Water Hazards		Surface water sampling and flow measurement in Soda Creek	Samples and flow measurements collected from bridges or banks, using buddy system	⊠Working on or over water		
Underground Utilities				☐Underground Utilities		
Confined Space(s)		Harris well is located in a vault. An additional Plan is required for this hazard- See Appendix	Forced air ventilation, atmosphere testing, inspection of space before entry	⊠Work in Confined Spaces		
Slips, Trips, Fall Hazards		Uneven, loose/unstable, or slippery terrain, hoses and extension cords	Scout travel paths, housekeeping at work locations	⊠Slips, Trips and Falls		
Other		Areas in barley fields south of Plant may be impassible if wet – may be slick or deep mud.	Do not drive on barley fields if muddy and wet			
Work at Heights						
Ladders/ Scaffolds						
Work Platforms						
Shafts						
Fall Protection (4' height for general industry, 6' height for construction)		An additional Plan is required for this hazard- See Appendix		Fall Protection		
<u>General Work</u> <u>Environment</u>						
Heat Stress	\boxtimes	Possible temperatures over 90°F	Cool drinks, frequent breaks in air conditioned car or building, watch for signs of heat exhaustion	⊠Heat Stress		
Cold Stress		Possible temperatures below 32°F but not anticipated – most work in late spring or early summer	Appropriate clothing and breaks in warm areas	⊠Cold Stress		
Lightening/Tornado/ Hurricane/Severe Weather		Possible thunderstorms during summer months	Watch weather, stop work, wait out storm in vehicle or building	⊠Inclement Weather		
Remote Site				Remote Isolated Surveys		
Noise Levels		Inside wellhouses for production wells and near hydroclarifier	Hearing protection - ear plugs	⊠Hearing Protection		



				April 2010
Hazard	Iden	tification of Project-Specific Conditions	Necessary Controls	Standard Work Procedure Attached (see Appendix B)
Insects (e.g., ticks)/Plants		Ticks, mosquitoes, and fire ants have been observed on and off site, wasps may present in spring houses, Harris well vault, and monitoring wells	Insect repellant containing DEET will be applied prior to working in grassy or brushy areas, especially offsite. Pant legs may be taped to shoes/socks in offsite areas. Use caution and watch for wasps when entering spring houses, or when opening well vaults and monitoring well lids.	⊠ Biological Exposure Risks
Wild Animal Habitat				☐Biological Exposure Risks
Housekeeping		Trash, hoses, extension cords, buckets	Trash bags, keep work areas neat, keep power cords and hoses away from travel areas around wells.	⊠Housekeeping
Poor Lighting				
Extended work hours				☐Fatigue Management
Working Alone				
Proximity to Traffic		Some areas of Plant are heavily traveled (near stockpiles or haul roads), some springs are near roads	Park vehicle well off road, notify Heavy Equipment Group when working in Plant high traffic areas, safety vests	☑ Traffic Safety
Other		Generator, field equipment, and full coolers are heavy to lift and move	Use 2 or more people to lift, follow recommended lifting procedures using legs, get Monsanto to lift and move equipment with forklift if possible.	
<u>Mechanical and</u> <u>Electrical Process</u>				
Unstable Structures				
Moving Parts/Heavy Equipment		Some areas of Plant are heavily traveled (near stockpiles or haul roads)	Park vehicle well off road, Notify Heavy Equipment Group when working in Plant high traffic areas, safety vests	⊠Working Around Heavy Equipment
Drilling / Pile Driving		Drilling is not currently anticipated but may occur at some future time based on ongoing groundwater sampling	A project specific HASP will be prepared if drilling is needed in the future.	Drilling
Excavation				☐Trenching and Shoring
Working on energized sources				□Lockout/Tagout
Welding, cutting, brazing				☐Welding/Cutting/Hot Work Safety
Portable generators		Portable generator for	Ground generator, secure	



Standard Work **Identification of Project-Specific Necessary Controls Procedure Attached** Hazard **Conditions** (see Appendix B) powering sampling pumps storage of fuel if needed. Most days the generator will be fueled at the Monsanto fuel bay and fuel will not be kept with generator. Keep power cords out of water around wells. Other Chemical/Biological Radiological Monsanto waters roads and work areas regularly and can Dust be called to water specific \boxtimes Possible wind-blown dust areas if needed Respiratory Protection Chemical Exposure Groundwater contains slightly Risks. Complete chemical elevated concentrations database and attach to this (above drinking water HASP (Appendix A). standards in some areas) of Nitrile gloves and safety Respiratory Protection Chemical contaminants cadmium, fluoride. glasses will be worn while \boxtimes manganese, nitrate, sampling and handling including carcinogens and selenium. Risk of ingestion, water. Eating and drinking will only take place after dermal adsorption, or other exposure is low. There are hands have been thoroughly no inhalation risks. washed. Some plant source material Radiation dose rates are not (ore) and by-product material expected to exceed natural stockpiles such as slag on background levels, radiation site contain slightly elevated monitoring will be conducted at each monitoring location natural radioactivity. prior to sampling activity. A Radiation dose rates are not expected to exceed natural portable radiation counter background levels based on will be used to take a site experience over the past background measurement in 20 years. an area resembling the natural environment away from ore stockpiles, slag, or man-made structures. The \boxtimes Radioactive Particles reading should be made at about three feet above the ground surface. The detector should then be used to take a reading at each sampling location at the Plant prior to starting sample collection. Should readings exceed 100 counts minute above the background reading, all work shall cease and the Project Manager contacted. Oxygen deficient Respiratory Protection Asbestos Asbestos Awareness



April 2010

Hazard	Identification of Project-Specific Conditions		Necessary Controls	Standard Work Procedure Attached (see Appendix B)	
				Program	
Explosive atmosphere					
Mold					
Other contaminants					
Fire	\boxtimes	Dry grass in sampling areas, generator fuel	Portable fire extinguisher, locate generator exhaust away from dry materials. Generator fuel (if needed) will be stored in approved container.		
Chemical Storage		Sample preservatives (HCI and H ₂ SO ₄)	Store in Lab-supplied vials and packing until use, MSDS on hand.		
Compressed Gas				Cylinders Gas	
Explosives (storage)			Air monitoring <u>must</u> be conducted.		
Explosives (transport)					
Nuclear Densometer		An additional Plan is required for this hazard- See Appendix			
Other					
Other Site Issues					
Landfill CQA				☐Landfill CQA	
Landfill Gas				☐Landfill Gas Sampling	
Hand and Power Tools		Hand tools (pliers, wrenches, etc) used to gain access to wells	Inspect tools before use, wear gloves	⊠Hand and Portable Power Tools	
GOLDER Hired Subcontractors		Possible pump subcontractor if pumps need service. Subcontractor HASP must be attached to the Golder HASP.	Subcontractor HASP, 801/PMIG procedures		
Possible exposure to violence from general public					
Cellular Phone Usage		Everyday phone use	Not while driving or when fueling generator or vehicle.	⊠Cellular Telephone Use	
Projectiles / Sharps				☐Bloodborne Pathogens	
Soil Sampling				☐Soil Sampling	
Groundwater Sampling		Well and spring sampling	Follow SWP	☐Groundwater Sampling	
Surface Water Sampling		Stream and pond sampling	Follow SWP	⊠Working on or over water	
Other					

MATERIAL SAFETY DATA SHEETS



April 2010

Under the Hazard Communication regulations, OSHA requires that Material Safety Data Sheets (MSDS) be available to employees for potentially harmful substances handled in the workplace. An MSDS documents information about the properties of a particular substance, such as physical data (e.g., melting point, boiling point, solubility, etc.), toxicity, health effects, first aid, and handling procedures. The purpose of the MSDS is to provide employees with procedures for working with a substance in a safe manner.

If potentially harmful substances will be handled during this project, the appropriate MSDS must be attached to this HASP (Appendix D).

Substance	Attached?	Substance Use
Alconox/Liquinox	\boxtimes	Phosphate soap used for decontamination purposes
Carbon Dioxide		Compressed gas used for air supply to pneumatic/bladder pumps
Deionized (DI) Water	\boxtimes	Used for decontamination, collection of field and equipment blank samples
Gasoline	\boxtimes	Fuel for field vehicles and generators
Hexane		May be used for decontamination of equipment
AutoCal Solution		Used to calibrate multi-parameter Horiba instruments
Hydrochloric Acid		Preservative for sample bottles for volatile organic compound analysis
Isobutylene		Calibration gas for photoionization detector
Isopropanol		May be used for decontamination of equipment
Methane		Calibration gas for flame ionization detector, multigas meters
Methanol		Preservative for soil sample bottles
Nitric Acid	\boxtimes	Preservative for sample bottles for metals analyses
Nitrogen		Compressed gas used for air supply to pneumatic/bladder pumps
Sharpies	\boxtimes	Used for labeling
Sodium Hydroxide		Preservative for sample bottles for sulfide and cyanide analyses
Sodium Thiosulfate		Preservative for sample bottles for coliform and related analyses
Sulfuric Acid	\boxtimes	Preservative for sample bottles for various inorganic analyses
Zinc Acetate		Preservative for sample bottles for sulfide analysis
Other		



PERSONAL SAFETY EQUIPMENT & TRAINING REQUIREMENT SUMMARY

Personal Protective Equipment (PPE) & Additional Equipment Required						
PPE/ Equipment	Required?	Notes:				
Hard Hat	\boxtimes	Required when in Plant				
Eye Protection	\boxtimes	Required at all times in and out of Plant				
Steel Toe Boots	\boxtimes	Required at all times in and out of Plant				
Hearing Protection		Required when working in wellhouses or high-noise areas				
Hi-Vis Vest		In high-traffic areas of Plant or when sampling near roads				
Face Protection						
TYVEK Suit						
Gloves		Nitrile gloves for sampling, leather gloves for moving generator and handling extension cords and hoses				
Fall Protection						
Life Preserver (PFD)						
Cold Weather Gear		May be needed depending on season				
Self Rescuer						
Dosimeter(Badge)						
Headlamp						
Boots (other)						
Bear Spray						
Air Monitoring Equipment	\boxtimes	Oxygen sensor for Harris Well sampling				
Fire Extinguisher		In vehicle				
First Aid Supplies		In vehicle				

Training Requirements					
Training Program	Required?	Staff Requiring Training			
Golder Health & Safety Orientation	X	All Golder Field Staff			
OSHA 10-hr Construction Safety	X	All Golder Field Staff			
First Aid/CPR	X	All Golder Field Staff			
OSHA HAZWOPER (40 Hr)		All Golder Field Staff			
MSHA Part 48 - Surface					
MSHA Part 48 - Underground					
MSHA Part 46 - Surface					
Confined Space Entry		For Harris Well vault entry only - see Appendix B			
Fall Protection	Ш				
Respirator Fit Testing		Respirator with acid gas cartridges required to be carried when working near furnaces and hydroclarifier			
Transporting Hazardous Materials and Dangerous Goods					
Client-specific Emergency Procedures	\boxtimes	Discussed in site-specific orientation			
Boat Safety					
Helicopter Safety					
Fall Protection					
Nuclear Gauge					
Client Specific	\boxtimes	Discussed in site-specific orientation, Attachment C			



April 2010

Personal Protective Equipment (PPE) & Additional Equipment Required Whistle/ Air horn Washing Facilities \boxtimes In vehicle and Lab \boxtimes **Drinking Water** In vehicle Additional Communication \boxtimes Cell phones Wheel Chocks \boxtimes Sunblock As needed On person at all times in \boxtimes plant, worn as needed Safety Googles Insect repellant for For use offsite or in ticks/mosquitoesgrassy/brushy areas of DEET \boxtimes plant. Measure radiation levels at each location before \boxtimes Radiation gage sampling Long-sleeve shirts worn at Clothing \boxtimes all times No metal jewelry (watches, rings, bracelets, etc) worn on or off Plant site during

 \boxtimes

work.

Training Requirements

Jewelry



ACTION LEVELS FOR CONTAMINANT MONITORING

Not Applicable for This Project:

Site workers must notify the site health and safety coordinator immediately in the event of any injury, or if signs or symptoms of overexposure to hazardous substances are exhibited. Specific hazardous substances expected at the site and action levels are identified and listed below.

Parameter	Monitoring Instrument	Monitoring Frequency	Action Level/Criteria	Specific Action	
Oxygen APPLICABLE	Oxygen meter or	Continuously ¹	>25%	Fire hazard potential. Discontinue investigation. Consult the H&S Officer.	
FOR HARRIS WELL SAMPLING ONLY	tri/quad gas meter with oxygen sensor		19.5%-25%	Continue investigation with caution. Deviation from normal level (21-22%) may be due to presence of other substances.	
ONLY			<19.5%	Cease work and evacuate area. Contact PM and office HSC for further options. Upgrade PPE to Level B if investigation is authorized to continue. NOTE: Combustible gas readings are not valid in atmospheres with <19.5% oxygen	
Combustible	Combustible	Continuously	<10% LEL	Continue investigation.	
Gas or Vapor NOT APPLICABLE	gas meter – % LEL		10%-25% LEL	Continue on-site monitoring with extreme caution as higher levels are encountered.	
			>25% LEL	Explosion hazard. Withdraw from area immediately.	
Volatile Organic compounds NOT APPLICABLE	PID/FID	Continuously	If the PID/FID reading is (in breathing zone) ²	Cease work and upgrade to Level C if authorized by the HASP and appropriate for the contaminant. Proceed with work cautiously and continue air monitoring. Contact PM and Office HSC for further options as necessary and for all conditions	
Particulate NOT APPLICABLE	Real-time Dust Meter	Continuously	$\frac{\text{If the Dust Meter is}}{\text{zone})^{3}}$	requiring Level B.	

¹ This means at least four times an hour or whenever conditions change.

⊠ Chemical Exposure Information attached as Appendix A

² The action level should be established on each site based on the contaminants present and should be set at one-half of the lowest published standard. Be careful that the PID will measure the contaminant and compensate for how well the contaminant is measured (see manufacturer data). Specific action is required if four consecutive readings reach the action level. Breathing zone is defined as the hemisphere forward of the shoulders with a radius of six to nine inches.

³ These thresholds can be established by extrapolation from soil concentrations and should be the lesser of 5 mg/m³ as respirable dust or the extrapolated threshold. Specific action is required if four consecutive readings reach the action level.



FIELD SAFETY PROCEDURES CHANGE AUTHORIZATION

This Safety Procedures Change Authorization Form will be completed and signed before any safety procedures identified in this Site Safety Plan can be modified by the Field Team. All revisions to safety procedures must be approved by the Project Manager.

Change	
Number:	
Date:	
Duration of Task to be changed:	
Description of Procedures modification:	
Justification:	
Person Requesting Change:	Verbal Authorization Received From:
Name:	Name:
Title:	Title:
Signature	Approved by:
	(Signature of person named above to be obtained within 48 hours of verbal authorization)



Drainat Titla/Numbar

INCIDENT REPORT FORM

This report is to be completed by someone familiar with the incident. It should be completed and returned to the Health and Safety Officer whenever an incident occurs. If in doubt, fill it out.

<u>Incident:</u> any expected or unexpected happening that interrupts the work sequence or process and that may result in injury, illness, or property damage to the extent that it causes loss.

Project Title/Number.	
Completed by:	
Date of Incident:	Date of Report:
PERSONNEL INVOLVED List of all personnel involved	I in the incident:
TYPE OF INCIDENT Describe the incident:	
-	
INJURIES List injured personnel and the	ne injuries:
PREVAILING CONDITIONS Describe the prevailing wear	S ther, surface, equipment conditions which may have had a factor in the incident:
PERSONNEL PROTECTIV List PPE used prior to and d	





SITE MONITORING Describe any real time monitoring that took place prior to, during and/or after the incident:					
second any real time monitoring that took place prior to, daring analor after the modern.					
ACTIONS					
List personnel and outside agencies that responded:					
NOTIFICATIONS					
Were the following notified? Police☐ Fire☐ EMS☐ OSHA ☐ Other ☐					
RECOMMENDATIONS					
List recommendations to avoid/correct the incident:					
COMMENTO					
COMMENTS					
REVIEWED BY:					
REVIEWED BT.					
Site Health and Safety Coordinator					
Project Manager					
Project Director					



ON SITE SAFETY BRIEFING TRACKING FORM

Meeting Type- Site Orientation or Tailgate Talk	Meeting Attendee	Initials*	Date	Topics Discussed / Concerns Brought Forward

^{*}Please ensure that all workers (including other contractors) attending the safety meeting, initial the column beside their name



APPENDIX A

CHEMICAL EXPOSURE

The constituents of concern are metals (cadmium, manganese, and selenium), fluoride, nitrate, chloride, and sulfate that are present in slightly elevated concentrations in groundwater. Concentrations of these constituents exceed the drinking water criteria in wells completed near the old source areas (Old Underflow Solids Pond, Northwest Pond, and Old Hydroclarifier), in selected wells along the South Plant Fenceline, and in springs south of the Plant Fenceline. The primary chemical hazards are accidental ingestion or dermal absorption of water from splashing or immersion:

	PRIMARY HAZARD (Rate: Low, Med, High, Ext)							
Substance	Inhalation of Gases /Vapors	Inhalation of Dusts/ Mists	Ingestion	Dermal Absorption of Solids/ Liquids and/or Skin Contam.	Dermal Absorption of Gases/ Vapors	Corrosive /Irritant	Ignitability	Reactivity/ Explosion
Manganese	na	na	Low	Low	na	na	na	na
Nitrate	na	na	Low	Low	na	na	na	na
Cadmium	na	na	Low	Low	na	na	na	na
Fluoride	na	na	Low	Low	na	na	na	na
Selenium	na	na	Low	Low	na	na	na	na

Substance	Exposure Limit	IDLH Level	Health Effects
Selenium	0.05 mg/L (primary drinking water quality standard)	na	Hair or fingernail loss; numbness in fingers or toes; circulatory problems
Manganese	0.05 mg/L (secondary drinking water quality standard), 0.18 mg/L (risk-based criteria for site)	na	black to brown color; black staining; bitter metallic taste
Nitrate	10 mg/L (as nitrogen; primary drinking water standard)	na	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.
Cadmium	0.005 mg/L (primary drinking water quality standard)	na	Kidney damage
Fluoride	2 mg/L (secondary drinking water quality standard); 4 mg/L (primary drinking water	na	Bone disease (pain and tenderness of the bones); Children may get mottled teeth



April 2010

Substance	Exposure Limit	IDLH Level	Health Effects
	quality standard)		



APPENDIX B

GOLDER STANDARD WORK PROCEDURES



Confined Entry Procedures for Sampling at the Harris Well

The Harris Well is a former domestic well that is located in a vault. The vault has a ventilation port that allows passive ventilation. Access to the vault is through an approximate 3 foot by 3 foot hatch that is normally closed and locked. The vault is approximately 10 feet by 10 feet, and about 5 to 6 feet deep. Access into the well vault is required to install a temporary sampling pump and make a groundwater level measurement. Entry to the vault will be limited to installation and removal of the sampling pump and collection of a depth to water measurement. No other work will be conducted in the vault. A hose will be used to direct the purge water outside of the well and allow sampling outside of the vault.

The following procedure will be used to install and remove the pump:

- 1. Upon arrival at the well, the access hatch to the well will be unlocked and opened.
- 2. The generator for the sampling pump will be positioned downwind and at least 30 feet from the well vault during sampling.
- 3. Forced air will be used to ventilate the vault for at least 5 minutes.
- 4. The atmosphere will be tested for %0₂ prior to entry. If %O₂ is less than 21%, ventilation will continue until 0₂ levels reach 21%.
- 5. The vault will be checked for wasps and spiders before entry.
- 6. One person shall remain at the surface and in communication with the person entering the vault at all times in the event of an emergency. That person shall be equipped with a cell phone or radio for emergency communication.
- 7. Ventilation will continue during sampling until the sampling is complete and the pump removed.
- 8. The vault will be secured once sampling is complete.



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work in the field in locations where there may be biological exposure risks to hazardous flora and fauna.

2.0 BIOLOGICAL EXPOSURE RISKS – HAZARDOUS FLORA AND FAUNA INFORMATION

The scope of services for this project may create opportunities for site personnel to come in contact with potentially dangerous plants and animals. Precautionary measures should be taken to reduce possible contact with hazardous flora and fauna which may include, but not be limited to: application of bug spray, caution and care in handling collected organisms including wearing gloves, avoiding or leaving an area identified as containing a suspected hazardous plant or animal (e.g. poisonous snake) until the hazardous organism has been properly identified and/or removed.

If a field team member comes in contact with or is bitten or stung by any hazardous plant or animal, always follow the proper first aid procedures and contact the Site Safety Officer immediately.

In general, almost any terrestrial animal can be hazardous at times. Larger mammals and some birds may attack if you are in their territory, too close to their nest, between them and their offspring, etc. Also, if you are handling/attempting to handle wildlife, there may be a risk of bites or scratches leading to infection, excessive bleeding, or worse. Please always use caution when working with/around wildlife. Although they are often wary and will stay away from you, there are specific situations/times where this is not the case.

3.0 HAZARDOUS INSECTS

Poisonous Spiders

- <u>Widow Spiders (genus Latrodectus)</u> Southern Black Widow, Northern Black Widow, Brown Widow, and Red Widow
- Recluse Spiders (genus Loxosceles) Brown Recluse, Mediterranean Recluse, Chilean Recluse

While the poisonous spiders listed above are not known to be aggressive, spider bites can occur when the spiders are disturbed or feel threatened. Be careful of reaching under objects where the spider is hiding or when putting on clothing, gloves or shoes that have been sitting or stored for a long time into which the spider has crawled. The most common symptoms are intense pain, rigid abdominal muscles, muscle cramping, malaise, local sweating, nausea, vomiting, and hypertension. Blisters frequently appear at the bite site, which can become necrotic. If bitten, remain calm, and seek medical attention (contact your physician, hospital and/or poison control center). Apply an ice pack directly to the bite area to relieve swelling and pain. If possible to do so without further endangerment, collect the spider (even a mangled specimen has diagnostic value) for positive identification by a spider expert.

Bees, Wasps, Yellow jackets, Mosquitoes and Fire Ants

The hazards associated with insect bites and stings are based on allergic reactions to the venom produced by the insect. Anyone who has a history of severe allergic reactions to bee stings should carry an anaphylactic kit with an Epinephrine syringe (epi-pen), with them at all times when working in the field. If an epi-pen is unavailable, remove the victim from the area (to avoid further stinging), monitor for signs of anaphylactic shock, and seek medical attention.



Tick Identification

- Ticks are divided into two families, "soft" ticks and "hard" ticks. Their only source of nutrition is blood sucked from their hosts.
- Hard ticks live on the ground in vegetation, such as grassy meadows, woods, brush, weeds, and leaf litter.
- Ticks produce a cement-like substance that helps anchor them to the host.
- Ticks inject saliva (the saliva may also contain disease organisms, such as *Borrelia burgdorferi* which cause Lyme disease) containing a kind of anticoagulant into the blood pool to keep the blood from clotting.
- The Brown Dog Tick (*Rhipicephalus sanguineus*) has evolved to live indoors and can be found living inside your home. Brown Dog Ticks do not feed on humans.

Treatment for Ticks

- Use a small pair of curved forceps or tweezers, wear some gloves so you don't spread bacteria from the tick to your hands.
- Using tweezers, flip the tick over onto its back. Grasp tick firmly with the tweezers as close to the skin as possible. Gently pulling until the tick comes free. Do Not Twist or turn.
- Once removed, rinse it down a sink or flush it down a toilet. Consider keeping it in a tightly closed jar or taped to a piece of paper. You may need to show the tick to the doctor if you become ill from the tick bite.
- The area of the bite should leave a small crater or indentation where the head and mouthparts were embedded. If significant portions of the head or mouthparts remain, they may need to be removed by a doctor.
- Cleanse the bite area with soap and water or a mild disinfectant. Observe the area for several days for any reaction to the bite, such as a rash or signs of infection. Apply antibiotic cream to the area.
- Remember to wash your hands thoroughly after handling any tick or instruments that touched a tick. Clean and disinfect any instruments that were used.
- Most tick bites are probably harmless and may cause no problems. Ticks that have never fed, if handled properly, will not cause any harm. The earlier a tick is removed, the less the likelihood that the tick transmitted any disease.









Poison Ivy (Rhus radicans) Identification

- Three forms of poison ivy, 1) Erect woody shrub,2) Running Shrub 3) Woody Vine.
- Three leaflets, two to four inches long, dull or glossy green with pointed tips.
- The middle leaflet is generally larger than the two laterals.
- The margins of the leaflets are variable, appearing irregularly toothed, lobed, or smooth.
- The leaves are positioned *alternately* on the stems.
- Woody vines grow on trees or objects for support and have aerial roots along the stem.
- Treatment for Poison Ivy
- Have a 'poison ivy action kit' ready, with rubbing alcohol,
- a large bottle of water, some soap and gloves,
- Cleanse exposed areas with rubbing alcohol.
- Next, wash the exposed areas with water only (no soap yet, since soap can move the urushiol, which is the oil from the poison ivy that triggers the rash, around your body and actually make the reaction worse).
- Now, take a shower with soap and warm water.
- Lastly, put gloves on and wipe everything you had with you, including shoes, tools, and your clothes, with rubbing alcohol and water.
- Apply Ivy-Block to exposed areas to prevent Poison Ivy.

Do NOT burn these poisonous plants! The smoke will irritate your skin badly, and if it enters your nasal passages, throat and lungs it will likely cause serious problems and could result in death.







Poison Oak Identification

- Grows in the Eastern United States (from New Jersey to Texas) as a low shrub.
- Grows in the Western United States (along the Pacific coast) as 6-foot-tall clumps or vines up to 30 feet long.
- Oak-like leaves, usually in clusters of three.
- Can have clusters of yellow berries.
- Treatment for Poison Oak
- Initial treatment consists of washing the area with water immediately after contact with the plants. To relieve symptoms, use wet compresses and take cool baths.
- Nonprescription antihistamines and calamine lotion also may help relieve symptoms.
- Moderate or severe cases of the rash may require treatment by a health professional, who may prescribe corticosteroid pills, creams, or ointments.

<u>Do NOT burn these poisonous plants!</u> The smoke will irritate your skin badly, and if it enters your nasal passages, throat and lungs it will likely cause serious problems and could result in death.







Poison Sumac Identification

- Grows exclusively in very wet or flooded soils.
- Ranges in eastern United States and Canada.
- Pinnate leaves, 25-50 cm long.
- 7 13 leaflets to each leaf, leaflets are 4-10 cm long.
- Red Leaf veins.
- Small white or grey berry, produced in panicles 10-20 cm long.
- Panicles distinguish it from other sumacs which have red berries.

Treatment for Poison Sumac

- Immediately wash everything that might have touched the plant.
- Soothe itching with cool, wet compresses.
- Add ground oatmeal (approximately 5 cups) or baking soda to a cool bath and soak for 15 to 30 minutes you can even add baking soda or epsom salts to your bath, or make a paste of either of these and apply it to the rash.
- Opt for lotions containing calamine, alcohol and zinc acetate; these will dry the blisters and help speed healing and leave rash open to air. That will help it heal
- Take an oral antihistamine if you are extremely uncomfortable or if the rash is covering a large area of your body.

Do NOT burn these poisonous plants! The smoke will irritate your skin badly, and if it enters your nasal passages, throat and lungs it will likely cause serious problems and could result in death.







Wild Parsnip Identification

- Pinnately compound leaves, with a main stem and 5 to 15 leaflets.
- Yellow flowers, in flat-topped umbrella-like clusters at the top of the plant.
- Wild parsnip rosettes are among the first plants to become green in spring, and its flowers turn a prominent yellow in midsummer. After flowering and going to seed, plants die and turn brown in fall, but first year rosettes remain green until frost.
- Grows throughout the United States along: Roadsides, abandoned fields, unmowed pastures, edges of woods, prairie restorations.

Treatment for Wild Parsnip

- Take Ibuprophen for help with swelling and pain. The burned area can be covered with a cool, wet cloth. If blisters are present, do not pop them and if the blisters rupture, leave the skin "bandage" in place. To avoid infection, keep the area clean and apply an antibiotic cream.
- Adding Domeboro powder to cool cloth compresses can help dry any of the seeping blisters.
- Doctors will recommend a topical or systemic cortisone-steroid for extreme discomfort. See a doctor for serious cases.
- Washing with Fels-Naptha soap will not help.





Snakes

- leave snakes alone;
- wear rubber boots, long trousers and long sleeved shirts; the fangs of a snake will not normally penetrate such clothing;
- be noisy when walking in the bush; stamp your feet;
- look carefully when walking through grass; and
- do not place bare hands in hollow logs, under piles of wood or rubbish. WEAR GLOVES.



Snake Bite Victims

Most snake bites occur on the limbs, with 75% of reported cases being on the lower limbs. If anyone is bitten be more concerned about the casualty than about identifying the snake. Unconsciousness and breathing failure may occur. The only widely acceptable treatment for venomous snakebites involves the use of antivenin. If someone is bitten by a venomous snake, seek immediate medical attention at the nearest hospital or medical facility. Stay calm, remove any rings that could restrict circulation if tissues swell, keep the bitten limb below the level of the heart, and immediately seek medical attention.

Symptoms of Snake Bite

- headache
- double-vision
- drowsiness
- nausea
- pain or tightness in the chest or abdomen
- giddiness or faintness
- diarrhea

These symptoms do not appear immediately, but from about 15 minutes to 2 hours after being bitten. If a snake bite is suspected, act promptly and obtain medical assistance without delay - **HOWEVER, STAY CALM.**

Signs of Snake Bite

Look for:

- 2 puncture marks about 1 cm apart at the site of the bite, although sometimes they may only be a fang scratch on the skin (although this depends on the size of the snake)
- swelling of the area around the bite
- bruising
- sweating
- vomiting
- breathing difficulties

Management of Snake Bite Victims

- keep the victim at rest
- reassure the victim
- immediately apply a pressure immobilization bandage over the bitten area and around the limb
- apply the bandage firmly enough to compress tissues, but not so firmly as to restrict the flow of blood to the limb below the bandage
- bandage from the bite to the fingers or toes, then up to the armpit or groin



- bandage as much of the limb as possible
- if assistance is available, get them to seek medical aid urgently. It is better to wait for the arrival of an ambulance or ambulance officer rather then to move the victim, but isolation and other circumstances should determine what is to be done
- periodically observe and record the pulse and breathing
- carry out EAR/CPR if breathing or circulation fails

As a precaution: **Do not catch a snake and do not handle one unless you are sure it is not venomous.** In addition, for a short time after a snake is killed, its reflexes may continue to work. Those reflexes typically cause the body to writhe slowly for awhile, but they can cause a convulsive contraction and a bite, so you should not handle a freshly killed venomous snake. Though US medical professionals may not agree on every aspect of what to do for snakebite first aid, they are nearly unanimous in their views of what not to do. Among their recommendations:

WARNING - WHAT NOT TO DO

- **NEVER** wash the venom off the skin; the venom will help identify what type of snake is involved EMERGENCY DECONTAMINATION PROCEDURES DO NOT APPLY:
- **NEVER** cut or excise the bitten area. Such measures have not been proven useful and may cause further injury.
- **NEVER** try to suck the venom out of the wound; and
- NEVER use a constrictive bandage or tourniquet. This cuts blood flow completely and may result in loss of the affected limb.
- **NEVER** ice or any other type of cooling on the bite. Research has shown this to be potentially harmful.



Timber Rattlers Identification

- The Timber Rattler is an endangered species.
- Adult timber rattlers average 35 to 50 inches in total length.
- The tail is short and thick, all black, and tipped with a tan rattle.
- Timber rattlers are diurnal (active during the day) and nocturnal (active after dark) in the summer, but only diurnal in the spring and fall.
- This venomous species can inflict a serious bite, and people are urged to walk away from them when encountered. Records show that there is a greater risk of being bitten if an attempt is made to kill them
- During the summer, they inhabit deciduous forests and open valleys. Rock fissures and crevices provide communal dens for over wintering.
- Timber rattlers begin emerging from hibernation in April to early May.

Treatment for Timber Rattlers

- Moderate symptoms will include mild swelling, discoloration, and pain at the wound site, and may also include general tingling, weakness, rapid pulse, and dimness of vision, nausea, vomiting, and shortness of breath.
- For moderate symptoms, apply a band 3/4 inch to 11/2 inches wide to the limb, 2 to 4 inches above the wound (but not around a joint, or on the head, neck, or trunk). Make it snug, but loose enough so you can slip a finger under it. Check the victim's pulse beyond the band periodically; to be sure blood is flowing past the band. Loosen the band if it becomes too tight.
- Severe symptoms include rapid swelling and numbness, followed by severe pain at the wound site; there may also be pinpoint-size pupils, facial twitching, slurred speech, convulsions, paralysis, and loss of consciousness. For severe symptoms, apply the band, and then make a shallow cut-just through the skin-through each fang puncture, 1/2 inch long and parallel with the long axis of the limb. (Make no cuts on the head, neck, or trunk). Apply a suction cup for 30 minutes, or use your mouth to such out the venom. Don't apply ice packs or any other kind of cold therapy. Continue treatment until you can get medical help. Most people who die of snakebite today die because they didn't seek medical help or delayed too long in going to the hospital. Preventive medicine is the best method for dealing with snakebites.
- Begin first aid treatment by keeping the victim calm and immobile, preferably lying down. Immobilize the bitten limb, at or below heart level. If the victim will be able to get to a hospital within 4 or 5 hours-and no symptoms develop-no more first aid is necessary.







4.0 HAZARDOUS FRESHWATER AND SALTWATER LIFE

Fin spines

Many fish have sharp spines in their fins that can cause puncture wounds if not handled properly. Although most do not have toxins/venom in their spines, the wound may still get infected if not properly cleansed and bandaged. Sharp teeth that may cause moderate to severe lacerations if not handled properly. The following sections provide examples of fishes and/or organisms that may require special handling or avoidance.

Stingrays

Stingray skin can be slippery, and need to be handled with gloves. If a stingray stings you, seek immediate medical attention. Infection can develop from bacteria entering the wound via seawater or from the stinger (spine) itself. A stingray spine can also break off in the wound and cause infection if it is not removed; however, the spine is serrated, so if the spine breaks off in the wound, do not remove it yourself. Instead, apply first aid for a puncture wound, including flushing/rinsing the wound with fresh water or hydrogen peroxide if available, and seek immediate medical attention. Sometimes the spine will stick into the person without breaking off of the animal. In this case, cut the spine from the animal close to the base of the tail, leaving as much of it sticking out of the wound as possible. The pain of the stingray toxin can be alleviated before reaching a medical facility by applying a heat compress to the wound or soaking it in clean, hot water which breaks down the protein-based toxin.

Catfishes

Catfishes have spines very similar to stingrays. Treat as you would for a stingray wound.

Scorpionfishes, Leatherjackets, Toadfishes

Some, if not all species of fish in these groups have poisonous spines in their dorsal, pectoral, and/or anal fins. The spines are very sharp and the toxin in them can cause varying degrees of reaction. By far, the scorpionfishes have the most potent toxin in their spines and some species can be much larger than others. In the case of being stung by any of these fish, apply first aid for a puncture wound, and watch for signs of reaction to the toxins. Seek medical attention if necessary. The pain of the toxin can be alleviated before reaching medical facilities by applying a heat compress to the wound or soaking it in clean, hot water.

Sea Urchins

Sea urchins have sharp spines that project out and protect their main body, or test, from all angles. While some species have poisonous or toxic spines, the primary hazard is from puncture wounds where the spine breaks off in the wound and the resulting infection. The spines, like the rest of the urchin's body, are primarily made of calcium that can be brittle and hard to remove. If someone gets stuck with urchin spines, flush the area well with water and hydrogen peroxide (if available). If the wound is large or there are large pieces of spine embedded in the wound, apply first aid as you would for a normal puncture wound and monitor for signs of allergic reaction to possible toxins. Applying a heat pack in the immediate area of the wound may relieve some of the pain associated with the toxin if it is present. It may be necessary to go to the hospital to get the pieces of spine removed.



STANDARD WORK PROCEDURE BIOLOGICAL EXPOSURE RISKS HAZARDOUS FLORA AND FAUNA

Jellyfish

Most species of Jellyfish have stinging cells, called nematocysts, which trigger or "fire" upon touch. If jellyfish are encountered in the net, the use of gloves in handling them can prevent the person from being stung, as the nematocysts are usually very small and will not penetrate the glove. However, be cautious after handling jellyfish even with a glove, as some of the nematocysts can rub off and remain on the glove and still fire long after the jellyfish has been removed. If someone gets stung by a jellyfish, it is best to rinse the area with vinegar (do not use fresh water, as that can cause more nematocysts to fire). Different species of jellies have various levels of toxin in their sting. There is a potential for allergic reaction, so monitor the victim and seek medical attention if necessary.

Corals and Sponges

Corals and Sponges have stinging cells similar to Jellyfish. If someone is stung by a species of coral or sponge, treat the same as above for jellyfish.

Crabs/Crayfish/Lobsters

All of the above can have very strong and very sharp claws. Use caution when handling them.

Oysters/Mussels/Clams

Oysters and Mussels have extremely sharp edges that can cut easily. Care should be taken when handling and always wear gloves.

American Alligator (may encounter on land or in the water).

The best treatment for alligator wounds is avoidance or prevention of encounters. When left alone, alligators will stay away from humans and pose little threat. The springtime is when alligator breeding season begins in Florida. During breeding season, male alligators become very territorial and will defend their area against intruders. Following the breeding, in June-July, females will lay their eggs in nests created in the preceding months. These nests are mounds of mud, leaves and other vegetation and can be ~1 meter tall and ~2 meters wide. Look out for these nests near the shoreline of swamps, rivers, and estuaries, as female alligators remain near the nest, in nearby water or other shelter, throughout the incubation period, which averages 65 days, and will defend her nest if danger threatens. If someone is attacked by an alligator, apply first aid, including pressure to any open wounds, and seek immediate medical attention.

STANDARD WORK PROCEDURE HEAT STRESS

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work in the field in locations where there is potential for heat stress conditions to develop.

2.0 HEAT STRESS

Employees may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the location of the site, the type of work, and the time of year. The project manager (PM) should consider the need to monitor heat stress during the project planning stage. The Site Safety Officer (SSO) and/or field staff will evaluate heat stress using the techniques specified below whenever the ambient temperature exceeds 21°C or 70°F.

3.0 HEAT STRESS RELATED PROBLEMS

- **Heat Rash** caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat, as well as being a nuisance;
- **Heat Cramps** caused by profuse perspiration with inadequate fluid intake and chemical replacement. Signs: muscle spasms and pain in the extremities and abdomen;
- Heat Exhaustion caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness, and lassitude. If symptoms occur, the employee should leave the work area and proceed to the nearest air-conditioned location, drinks liquids such as water or Gatorade, and rest until the symptoms pass. Contact the Golder PM immediately; and
- Heat Stroke the most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma. Medical help must be obtained immediately. If heat stroke is suspected, implement emergency response plan. Remove excess clothing and cool the person by sponging with cool or luke warm water. Never place ice on the person or throw water on the individual. Contact the Golder Project Manager as soon as time permits.

4.0 HEAT STRESS MANAGEMENT

4.1 Heat Stress Monitoring

The American Conference of Governmental Industrial Hygienists (1992) states that workers should not be permitted to work when their deep body temperature exceeds 38°C (100.4°F).

For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to monitor the work cycle of each site worker. There are two phases to this monitoring: initial work/rest cycle determination and physiological monitoring. The initial work/rest cycle is used to estimate how long the first work shifts

STANDARD WORK PROCEDURE HEAT STRESS

of the day should be. Heart rate monitoring of each worker will establish the length of the successive work periods.

4.2 Determination of Initial work/Rest Cycles

Measure the air temperature with a standard thermometer. Estimate the fraction of sunshine by judging what percent the sun is out: 100% sunshine - no cloud cover = 1.0; 50% sunshine and 50% cloud cover = 0.5; 0% sunshine = full cloud cover = 0.0.

Plug these variable into the following equation to determine the adjusted temperature:

 $T(^{\circ}C, adjusted) = T(^{\circ}C, actual) + (7.2 x fraction sunshine)$

Use the chart below to determine the length of the first work shift. At the first break, initiate the heart rate monitoring as described in the next section.

ADJUSTED TEMPERATURE	NORMAL WORK CLOTHING	IMPERMEABLE CLOTHING
21° - 25°C (70-77°F)	150 Minutes	120 Minutes
25° - 28°C (77-82°F)	120 Minutes	90 Minutes
28° - 31°C (82-88°F)	90 Minutes	60 Minutes
31° - 32°C (88-90°F)	60 Minutes	30 Minutes
>32°C (>90°F)	45 Minutes	15 Minutes

4.3 Heart Rate Monitoring

Heart rate (HR) should be measured by radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33 percent while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work period should be further shortened by 33 percent while the length of the rest period stays the same.

4.4 Heat Stress Prevention

The best approach is preventive heat stress management. In general:

have workers drink additional water before beginning work;



STANDARD WORK PROCEDURE HEAT STRESS

- provide disposable cups of water that is maintained at 10 to 16°C (50 to 60°F);
- urge workers to drink one to two cups of water every 20 minutes or at each rest break for a total of four to eight litres per day;
- provide a cool, preferably air-conditioned area for rest breaks;
- discourage the drinking of alcohol at night and discourage the intake of coffee during working hours;
- monitor for signs of heat stress;
- acclimatize workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities; and
- Reschedule your work hours so that you are not working in the heat of the day between 10 am and 2 pm.

4.5 Sun Protection

- Employees are encouraged to maximize use of the shade provided by trees, buildings and other structures. Where there is limited access to natural shade, fixed or portable shade structures may be used and will be provided where practical.
- Rotate your work with others between indoor/shaded areas and outdoor/exposed locations to minimize time spent in the sun.
- The selection of appropriate protective clothing will take into account both the need to block out UV and the need to reduce the effects of heat.
- It is recommended that Golder employees tight woven clothing which has a minimum UPF of at least 30. Clothing should be lightweight, loose fitting and have a collar to assist with keeping cool.
- Hats provide shade and the bigger the brim the greater the amount of shade that is provided. Hats should be made of close-weave material and have a wide brim or be legionnaire-style. In circumstances where the wearing of a broad-brimmed hat causes difficulties due to their size sunscreen and other protective measures should be used instead.
- Safety glasses will be supplied to protect the eyes from effects of UV radiation and potential eye injuries from flying objects, dust or chemical splashes. Safety glasses complying with ANSI Z87.1-2003 are recommended.
- Sunscreen does not offer complete protection and should always be used in conjunction with other protection such as protective clothing. Broad spectrum and water-resistant sunscreen with a sun protection factor (SPF) of 30+ should be used.
- Staff using sunscreen are encouraged to regularly check use by dates to ensure sunscreen is not out of date.
- Sunscreen will be placed in an easily accessible location and employees instructed in correct application and use. Sunscreen should be generously applied to all areas of exposed skin at least twenty minutes before going outside and should be reapplied at least every two hours.



STANDARD WORK PROCEDURE COLD ENVIRONMENT – COLD STRESS

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work in the field in locations where there is potential for cold stress conditions to develop.

2.0 COLD ENVIRONMENT - COLD STRESS

In a cold environment, body heat must be conserved to maintain the core temperature at normal levels and to ensure an adequate blood flow to the brain and extremities. Feelings of cold and discomfort should not be ignored, since these may be early warning signals. The effects of cold are such that problems can occur before the worker is aware of them, and furthermore, over-exposure to cold may affect judgment.

3.0 MAIN FACTORS INVOLVED IN CAUSING COLD STRESS

- Temperature
- Humidity
- Movement of air
- Radiant temperature of the surroundings
- Clothing/physical activity

4.0 COLD STRESS RELATED PROBLEMS

- Frostbite is a condition in which the skin and underlying tissues freeze. Usually affects fingers, hands, toes, feet, ears and nose.
- Hypothermia is a condition in which a person's body temperature falls below 95⁰ F or 35 degrees Centigrade. Hypothermia occurs when more heat is lost from the body than the body can produce. It usually happens when a person is exposed to extremely cold temperatures but it can occur even at moderate temperatures. It does not have to be freezing outside for a person to become hypothermic. For example, falling into cold water or wearing wet clothing in cold weather can bring on hypothermia. Failing to wear a hat in cold weather can also lead to hypothermia, since a large amount of body heat escapes from the head. Extreme fatigue, hunger or lack of fluids can also lead to hypothermia. As well, excessive wind can increase the amount of heat lost and cause hypothermia.

5.0 FROSTBITE MANAGEMENT

- Move person to a warm dry area. Don't leave the person alone.
- Minimize walking on frozen feet.
- Do not apply any lotions or ointments to frozen skin.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- DO NOT rub the affected area, because rubbing causes damage to the skin and tissue.
- Gently place the affected are in a warm (105°F) water bath and monitor the water temperature to slowly warm the tissue. Don't pour warm water directly on the affected



STANDARD WORK PROCEDURE COLD ENVIRONMENT – COLD STRESS

area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.

- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. NOTE: If there is a chance the affected are may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible and contact the Site Safety Officer.

6.0 HYPOTHERMIA MANAGEMENT

The most obvious sign of hypothermia is a low core body temperature. The person with hypothermia may not realize that his or her prolonged exposure to cold requires emergency medical care. Other signs and symptoms include:

- apathy or loss of interest in surroundings
- lethargy or difficulty moving
- confusion
- drowsiness
- loss of coordination
- cold skin
- shock caused by decreased blood flow
- slurred speech
- uncontrollable shivering
- weakness

If a person is suspected of suffering from hypothermia, contact the Site Safety Officer, and apply first aid.

6.1 What should be done (land):

- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, drying clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. Avoid drinks with caffeine (coffee, tea or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck and head areas. DO NOT rub the person's body or place them in a warm bath. This may stop their heart.

6.2 What should be done (water):

■ DO NOT remove any clothing. Button, buckle, zip and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.



STANDARD WORK PROCEDURE COLD ENVIRONMENT – COLD STRESS

- Get out of the water as quickly as possible or climb on anything floating. DO NOT attempt to swim unless a floating object technical water rescue can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

7.0 PRECAUTIONS

- Use the buddy system.
- Recognize the environment and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the sign and symptoms of cold induced illnesses/injuries and what to do to help the worker.
- Dress appropriately for expected weather conditions. Dress in a minimum of three layers (a skin layer to absorb moisture and keep the skin dry, an insulating layer, and an outer protective layer), wear a hat and gloves, in addition to underwear that will keep water away from the skin.
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Eat warm, high calorie foods like hot pasta dishes.
- Avoid vasodilators, which allow the body to lose heat faster which can accelerate hypothermia. These include alcohol and drugs;
- Avoid vasoconstrictors, including tobacco products, which constrict blood vessels and can accelerate the onset of frostbite;
- Avoid touching cold metal with bare skin; and
- Keep active.



1.0 SCOPE

This Confined Space Program applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff performing work in or near confined spaces.

2.0 DEFINITIONS

Attendant: The attendant is assigned responsibility for monitoring authorized entrants while inside a permit space.

Authorized entrant: An authorized entrant is a person authorized by the employer to enter a permit space.

Confined space: A space that is not designed or intended for continuous human occupancy;

- has limited or restricted means for entry or exit that may complicate the provision of first aid evacuation, rescue, or other emergency response service; and
- is large enough and configured that a worker could enter to perform assigned work.

Typical confined spaces a Golder employee might encounter include monitoring well manholes, certain remediation system buildings (depending on construction and internal configuration), excavations and trenches deeper than 4 feet, tanks, wastewater manholes, and vaults.

Entry: Entry into a permit space is considered to be breaking the plane of an opening into the space with <u>any part</u> of the employee's body. "Breaking the plane of entry" <u>only</u> applies to spaces that meet the Permit-Required Confined Space definition. This means the space has to have some additional hazards, such as atmospheric contaminants <u>and</u> be big enough to <u>bodily enter to perform work</u>.

Entry permit: A written document provided by the employer to allow, oversee and control entry into a permit space and which contains information detailed in this SWP.

Entry supervisor: Person assigned responsibility for verifying acceptable entry conditions are present, authorizing entry, overseeing entry, and terminating entry into a permit space.

Hazardous Atmosphere: An atmosphere that may expose employees to death, serious injury or illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 % of its lower explosive limit (LEL). [Note: LEL and Lower Flammable Limit (LFL) -lowest concentration at which a flammable vapor will ignite are interchangeable terms].
- Airborne combustible dust at a concentration that meets or exceeds its LEL, or obscures vision at a distance of 5 feet;
- Has an atmospheric oxygen concentration less than 19.5 % or greater than 23.5 %;



- Has an atmospheric concentration of a toxic air contaminant in excess of any published recommendation or standard; and
- Presence of any other atmospheric condition that is immediately dangerous to life or health.

Non-Permit Confined Space: A confined space that contains no physical hazards capable of causing death or serious physical harm to entrants and which has <u>no possibility</u> of developing a hazardous atmosphere.

Permit-Required Confined Space: A confined space that has <u>one or more</u> of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that could engulf an entrant;
- Has an internal configuration that could trap or asphyxiate an entrant; or
- Contains any other recognized serious safety or health hazard.

Rescue Team: The personnel designated to rescue employees from permit spaces.

3.0 APPLICABLE REGULATORY REFERENCES

- 29 CFR 1910.146 Permit Required Confined Spaces
- 29 CFR 1926.21 Safety Training and Education for Construction
- Title 8 California Code of Regulations (T8CCR), Section 3203, and Article 108 sections 5156-5158.

4.0 RESPONSIBILITIES AND AUTHORITY FOR IMPLEMENTING THE PROGRAM

4.1 Corporate Health and Safety

The National Health and Safety Leader (NHSL) is responsible for implementation of the program. Specific responsibilities include:

- Development and implementation of the written Permit Required Confined Space Entry Program;
- Review and evaluation of confined space entry permits as requested by employees;
- Provision for audits of all elements of the program to evaluate the effectiveness and extent of compliance with program requirements;
- Provide assistance on selection of safety gear, personal protective equipment (PPE), and provide annual refresher training for affected employees; and
- Assigning appropriate responsibility to implement, administer and enforce the program.



4.2 Office Health and Safety Coordinator

The Health and Safety Coordinator (HSC) assists the NHSL in implementing the program at the local level. The HSC's responsibilities include:

- Assuring that all open projects are reviewed for presence of confined spaces, classifying the spaces, securing (to prevent unauthorized entry) all permit-required spaces, and authorizing entry permits;
- Providing confined space training, including hazard recognition, atmospheric testing and, use and limitations of PPE, and precautions to be taken for field employees and for team members prior to initiating project work where confined spaces must be entered. Additional training will be provided whenever a new work procedures is implemented or new hazards are identified in the space for which field staff have not been previously trained:
- Maintaining records at the office level of confined space entry permits and annually reviewing the program for adequacy and effectiveness;
- Serving as the local point of contact for the Permit Required Confined Space Program;
 and
- Maintaining local records of all confined space surveys, confined space entry permits, etc.

4.3 Employees

No Permit Required Confined Space Entry Program can be successful without support and implementation by all individuals within the company. Employees' responsibilities include:

- Following company guidelines for proper use of all field monitoring equipment, testing protocols, and recordkeeping on site;
- Properly storing, cleaning, and maintaining all PPE;
- Never entering a permit-required confined space, even briefly, without a permit; and
- Following all Golder's entry procedures, including obtaining a permit, performing air monitoring, and using specified personal protective equipment.
- Maintaining current certification/training to perform confined space work.

Subcontractors

Subcontractors are responsible for following Golder's Permit Required Confined Space Entry Program requirements while performing work in confined spaces on Golder worksites. Coordination between Golder and subcontractor safety programs is critical to project success. Where there are discrepancies between Golder's program and the subcontractor's program, the most conservative approach should be taken. Golder must share information on all our confined spaces with contractors who may be expected to perform permit-entries. Review of our confined space program and entry procedures, when necessary, will be conducted as part of the on-site review of the Site Health & Safety Plan prior to start of work.



5.0 TRAINING AND PERSONAL PROTECTIVE EQUIPMENT

Training is the most critical element of Golder's program. Training and/or review of use of all testing and air monitoring equipment, personal protective equipment, rescue and safety equipment, communications devices and alarm systems will be provided to all authorized entrants, attendants and entry supervisors and practice entry drills will be conducted before each new permitted entry. Depending on the nature of the project, training in lockout/tagout and hot work may be required. Golder staff conducting atmospheric testing will be well-trained and experienced in the use of all testing equipment. Authorized entrants will be given additional training whenever new hazards or operations within a permit space change and for which the employee has not previously been trained. A list of minimum training topics and **Acknowledgment of Confined Space Training** form is included in Appendix 1. Training will be documented with drills or quizzes that demonstrate employee understanding and skills needed to safely enter, work in, and exit permit spaces. Documentation of training will be maintained as a permanent part of the employee's personnel file.

PPE necessary to conduct confined space entry work will be provided by Golder at no cost to the employee. This includes (but is not limited to): recovery harness; respirators; atmospheric monitoring equipment, etc.

6.0 PERMIT REQUIRED CONFINED SPACE PROGRAM

All confined spaces must be considered "permit-required" spaces until further investigation and documentation reveals the nature and extent of specific hazards. To downgrade a permit-required space to a non-permit confined space; all physical hazards must be effectively eliminated (such as locking out electrical and moving equipment). Initial atmospheric testing during inspection prior to entry must show no actual or potential atmospheric hazards. Confined spaces with actual or potential atmospheric hazards may not ever be downgraded to non-permit spaces. Using forced air ventilation to control atmospheric hazards does not constitute elimination of the hazard.

However, if the only hazard in the permit-required confined space is an actual or potential atmospheric hazard and it can be demonstrated that forced air ventilation will control the hazard, entry may be conducted using a less restrictive procedure which is explained in detail in Section 9 (Alternative Entry Procedures) of this program. In all cases, if initial entry is required to collect test data to complete the hazard assessment-including evaluation of actual or potential atmospheric hazards--the entry must be permitted and conducted in full accordance with Golder's written Permit-Required Confined Space Entry Program and all test data must be documented. Documentation of atmospheric testing must include date of the testing, location of the space tested, and signature of the tester.



6.1 Confined Space Survey

Annual reviews of all confined spaces will be made on all open projects. Whenever possible, new remediation systems should be designed so that they do not meet the definition of a permit-required confined space. A form to document this initial evaluation and classification of the space is included in Appendix 2. Upon completion of the survey, all identified confined spaces will be posted with warning signs, locked where feasible, and personnel working on these sites will be given specific training on Golder's Permit-Required Confined Space Program.

7.0 HAZARD ASSESSMENT

The most common hazards in confined spaces are the presence of atmospheric contaminants, risk of thermal or chemical burns, fire, mechanical and/or electrical hazards, noise, heat stress, and engulfment. OSHA studies have shown that nearly 90% of confined space injuries and deaths in confined spaces have been due to hazardous atmospheres.

- Flammable gas, mist or vapor in excess of 10% of its LEL.
- Airborne combustible dust at a concentration greater than its LEL (approximated by obscuring vision at a distance of 5 feet).
- Atmospheric oxygen concentration less than 19.5% or greater than 23.5%.
- Atmospheric concentration of any air toxic in excess of its PEL (Permissible Exposure Limit) or TLV (Threshold Limit Value).
- Any other atmospheric condition that is immediately dangerous to life and health (IDLH).

Some atmospheres may be combinations of more than one of the above. For example, methane in air is harmless at concentrations below 10%, explosive between 10% and 90%, and asphyxiating at levels above 90%. Table 1 provides LEL, PEL, TLV, and IDLH information on some common confined space air contaminants.



TABLE 1

Contaminant	LEL	PEL	TLV	IDLH
Gasoline	1.4%	NA	300 ppm	2,000 ppm or
				>10% LEL
Benzene	1.2%	1 ppm	0.5 ppm	500 ppm
Carbon monoxide (CO)	12.5%	50 ppm	25 ppm	1,200 ppm
Carbon dioxide (C0 ₂)	NA	5,000 ppm	5,000 ppm	40,000 ppm
Hydrogen sulfide (H ₂ S)	4%	20 ppm ceiling	10 ppm	100 ppm
Oxygen	NA	NA	NA	< 19.5%
				> 23.5%
Methane	5.3%	None established	None established	Simple asphyxiant

At no time will a Golder employee enter a confined space with a flammable atmosphere present.

Other types of hazards may include the presence of venomous insects (spiders), snakes or scorpions, traffic hazards, and oxygen depletion inside the space during hot work operations. A thorough evaluation of potential hazards must be made before entry is even contemplated.

Once hazards have been identified, control measures must be evaluated. Lockout/tagout, blanking or blinding, and line breaking are all examples of controls for various types of mechanical hazards. Cleaning, inerting, and ventilating a space are common solutions to chemical contamination in a closed vessel such as an underground storage tank. Personal protective equipment such as respiratory protection, eye and hearing protectors, head protection, and protective gloves and clothing are examples of additional controls that may be used in conjunction with engineering controls to eliminate or reduce hazards to acceptable levels for a permitted entry.

Golder will not conduct confined space work in known IDLH conditions. In these situations, Golder will subcontract this work to specialized contractors with the level of training, experience, and equipment necessary to conduct this work safely.

8.0 ATMOSPHERIC TESTING

From the definition of a "confined space," it is easy to see that air movement may be restricted inside the space and that hazardous or explosive air contaminants may collect inside. A confined space should never be entered without testing and monitoring the atmosphere. Atmospheric testing is one of the most critical



phases of confined space evaluation, and knowledge of the testing sequence, instruments used, calibration procedures, and interpretation of results is essential!

8.1 Test Sequence and Equipment Calibration

OSHA requires that atmospheric testing be conducted in the following sequence in multiple locations throughout the confined space:

- 1. <u>Calibration</u> must be done following manufacturer's instructions and results maintained in a calibration log. Flammability is always assessed after checking oxygen content of the space because flammability testing instruments will not function in oxygen deficient atmospheres. Testing for the presence of flammable gases and vapors should be done using an explosion meter calibrated prior to each use with a calibration gas that has a similar response curve to the air contaminant being measured (e.g. methane should be used for landfill and sewer work; hexane for petroleum related work; etc.).
- 2. Oxygen content measurements should be made before other gases. Unless oxygen is within the acceptable range, flammability measurements will not be accurate. Use an oxygen meter calibrated in ambient air to 20.9%. Readings less than 19.5% and greater than 23.5% are unacceptable. No Golder employee will enter a permit space with either an oxygen-deficient or oxygen-rich environment.
- 3. <u>Flammability</u> measurements should be made immediately following measurement of oxygen content. Flammable gases and vapors must not be present in excess of 10% of their LEL.
- 4. <u>Toxicity</u> measurements should be made after oxygen and flammability. Many toxic air contaminants have PELs set by OSHA. OSHA recognizes three types of PELs--8 Hour TWAs (maximum allowable exposure averaged over an 8 hour time period), STELs (Short Term Exposure Limits) and ceiling values. None of these 3 limits should be exceeded for any toxic air contaminant. Some air toxics may not have PELs established by OSHA. Instead, they have TLVs set by the ACGIH (American Conference of Governmental Industrial Hygienists) or other published standards or recommendations. Golder will always use whichever value is more conservative (lower) in assessing acceptable exposure limits. A variety of direct-reading instruments are available for this type of testing including photoionization and flame ionization detectors (PID/FIDs). It is essential to match the correct testing device with the toxic air contaminant being sampled.



Monitoring of space conditions will be conducted prior to conducting any entry. Similarly, periodic monitoring will be conducted throughout the duration of the confined space entry to verify conditions within the space. At any time, if one or more of the entry team members (or representatives) requests additional monitoring, it will be conducted without question. All team members will be trained in the use and calibration of all monitoring equipment and all will have the opportunity to calibrate or recalibrate any instrument as needed.

9.0 RECLASSIFYING THE SPACE

On many Golder worksites, reclassification of a permit space to a non-permit space may be possible. If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards are eliminated.

10.0 ALTERNATIVE ENTRY PROCEDURES

If an actual or potential hazardous atmosphere is the only hazard in a confined space, and if the hazard can be controlled with forced air ventilation alone, OSHA allows entry into this space using less stringent entry procedures. Because the entrant must have sufficient time for self-rescue from the space if the ventilation system should fail.

To use the alternate entry procedures without an initial permit-entry, all hazards must be eliminated and monitoring for hazardous or toxic atmospheres must be conducted without entering the space. Use of continuous forced air ventilation from a clean source; along with periodic testing of the atmosphere in the space comprise acceptable alternative entry procedures without presence of an entry attendant under this program. Written certification of the date of testing, location of the confined space, atmospheric test results and signature of the tester must be recorded in the field log book and become a permanent part of the project file.

11.0 VENTILATION

Confined spaces may be ventilated in any of several ways described below. Selection of the ventilation method used should be made based on the nature of the hazard (oxygen deficiency, presence of toxic or air contaminants). At no time will an employee enter a confined space where flammable atmospheres are present. When using ventilation:

- Never assume that ventilation is a substitute for air monitoring.
- Never ventilate with anything but uncontaminated air.
- <u>Always</u> provide a back-up power source for all electrically-powered ventilation devices in case the first source should fail.



The person conducting the ventilation must be clear from the path of air exhaust from the space being ventilated.

11.1 Local Exhaust Ventilation

Local exhaust ventilation acts to dilute air contaminants by pulling contaminated air out of the space where it can be diffused into the atmosphere or captured and treated if necessary. It relies on fresh make-up air entering the space through available openings. This kind of ventilation is not very effective for confined spaces and may only be used in concert with Supply Ventilation.

11.2 Supply Ventilation

Supply ventilation also works to dilute air contaminants, this time by pushing uncontaminated air into the space and forcing the air contaminants out through available openings. This type of ventilation alone works the best for confined spaces. High speed blowers are the most efficient devices for supply ventilation.

12.0 ENTRY PERMIT SYSTEM

Once it has been determined that a confined space meets all the criteria of a permit-required space, an entry permit should be generated by the project manager and submitted to the HSC. The entry permit is designed to document that measures have been taken to establish safe entry conditions, authorize specific personnel to enter the space, define the duration of the permit for work to be done, and control all work practices/procedures that will be performed during entry. Please refer to Golder's Confined Space Entry Permit in Appendix 3.

The front page of the permit will serve as a discussion and planning "checklist" for the individual planning the permit-entry and the HSC. In the field, this same page will serve to identify and document specific monitoring, ventilation, safety/rescue equipment, personal protective equipment, and permit space hazards prior to entry. Good pre-entry planning and assessment of permit-space hazards is essential for safe field work. The checklist will also be used by the HSC to determine if any additional training may be required for each unique permit-required confined space entry. The back page of the permit is designed to serve as an air monitoring log prior to and during entry. All pre-entry testing should be performed prior to the entry supervisor authorizing attendants to enter the permit-space.

Specific information contained on the permit includes:

- Permit space to be entered:
- Purpose of the entry;
- Date and duration of the entry permit;
- Name(s) of authorized entrant(s);



- Name(s) of attendant(s). No <u>permit-entry</u> may be conducted <u>without the presence</u> of an entry attendant;
- Name of the entry supervisor and space for his/her signature authorizing entry;
- Hazards anticipated within the space and control procedures;
- Method employed to isolate the space from unauthorized entrants;
- Define acceptable entry conditions;
- Provide space to record initial and periodic air monitoring results and identity of the testers;
- Identity and telephone numbers of emergency services and means to summon help (radios, telephones, etc.);
- Communication procedures to be used between entrant(s) and attendant(s);
- List of all equipment needed--personal protective equipment, rescue equipment, air monitoring equipment, communications and alarm systems (if needed); and
- Any other permits or information required that is unique to that space and necessary for work to be performed safely, such as Hot Work permits or Lockout/Tagout procedures.

The permit will be cancelled and signed by the entry attendant and entry supervisor at completion of work once all entrants are out of the space, or if work is terminated prior to completion due to changing conditions within the space. A copy of the cancelled permit should be kept in the project file for future reference. The project manager is responsible for returning the original cancelled permit to the office HSC after work is completed. Cancelled permits will be retained by the HSC for at least a year and all cancelled permits will be reviewed annually.

A permit-required space can only be reclassified as a non-permit required space in the rare event that air monitoring and other evaluations of that the space determine that it does not meet the permit-required criteria.

When entry to a confined space that is not owned by Golder is required, the same assessment process must be employed. Golder personnel must gather or cause to be gathered all of the information from the host employer.

13.0 ENTRY TEAM RESPONSIBILITIES

Entry team responsibilities include having authorized entrant(s), attendant(s), and entry supervisor(s). A properly trained and equipped employee may assume more than one of these roles. On most Golder sites with only one entrant in a permit space, the entry supervisor will likely assume the duties of attendant once entry has begun.



13.1 Authorized Entrants

Authorized entrants will receive training in hazard recognition and the effects of overexposure. They will be provided with appropriate PPE and the training to use it properly. (OSHA has determined that improper use or failure to use PPE is the major cause of confined space accidents.) Entrants are responsible for communicating their status and any change of conditions within the space to the attendant, and following the attendant's instructions if immediate evacuation of the space becomes necessary.

During training, the importance of recognizing warning signs or symptoms of overexposure will be stressed so that entrants will know to alert the attendant and initiate self-rescue in dangerous situations.

13.2 Entry Attendant

The main responsibility of the entry attendant is to continuously monitor, without distractions or conflicting duties, the activities and well-being of entrants inside the permit space. The attendant's training will include the same elements of hazard recognition and especially behavioral symptoms of overexposure so that the attendant will be able to make quick decisions regarding the safety of entrants. The attendant verifies that the entrant(s) are the ones listed on the permit, maintains an accurate entrant count, and prevents unauthorized entry into the space. The attendant <u>always</u> remains outside the space throughout entry to summon rescue and emergency services if needed. The attendant may also initiate and assist with non-entry rescue procedures.

On sites where multiple permit-required confined space entry teams may be working, one entry attendant must be appointed for each entry team. Under no circumstances should one entry attendant attend more than one confined space entry. Similarly, no entry attendant in this situation may fill the role of entry supervisor.

13.3 Entry Supervisor

The entry supervisor is responsible for verifying the availability and means of summoning rescue and emergency services, and for checking the completeness of the permit and adequacy of procedures and equipment. During the planning and execution of the entry, the entry supervisor will ensure that all necessary provisions are in place to prevent unauthorized entry and to provide barricades and/or barriers to protect the entry team from external hazards (such as pedestrians and/or vehicles). The entry supervisor will also verify that acceptable entry conditions on the permit have been met and communicate pre-entry atmospheric testing results to the HSC from the field, if necessary, prior to authorizing entry, and will terminate entry authorization under unacceptable conditions or once work is finished. The entry supervisor may assume the duties of attendant once entrants are inside the permit space. Entry supervisors will have



the same training in hazard identification and overexposure symptom recognition and will likely take responsibility for the air monitoring and hazard evaluation on site prior to authorizing entry.

On sites where multiple, Golder permit-required confined space entry teams may be working, the entry supervisor may oversee multiple entry teams. However, in this case, the entry supervisor may NOT also fill the role of entry attendant.

On sites where multiple employers may have permit-required confined space entry teams in operation, the entry supervisor and the HSC will coordinate with the other employers and their teams to provide a safe working environment and prevent unauthorized entry.

Depending on site conditions, the entry supervisor may require the placement of signs or barriers around the confined space entrance point to prevent access by unauthorized personnel.

14.0 SAFETY AND RESCUE EQUIPMENT

Retrieval systems will consist of full body harnesses with retrieval lines attached near the shoulder level to the back of the harness, or overhead. Mechanical lifting equipment is required for any spaces with vertical drops greater than 5 feet. Golder may either purchase or rent this equipment for specific permit space entries, and practice sessions using the retrieval equipment will be conducted <u>prior to each entry, if using rented equipment.</u>

15.0 RESCUE AND EMERGENCY SERVICES

Golder will use trained professional rescue services on permit-entry confined space sites whenever it has been determined that the professional responders are within close proximity and can assure very short transit times (less than 15 minutes) to the site. The rescue service will be provided with detailed information on the location of the space, nature of work to be performed, configuration of the space and any known chemical or mechanical hazards so that they will be adequately prepared to respond to a site emergency. They will also be provided the opportunity to observe the space and conduct a practice entry/recovery at their discretion. During the planning process, if the third party responder declines to assist Golder in this regard, alternative rescue/recovery contactor arrangements will be sought. Response time and availability of the responders will be verified by the entry supervisor prior to authorization of the permit for entry.

Where client facilities maintain confined space rescue/recovery teams to be used on the project, contract documents will provide clear and unambiguous language describing the terms of host facility rescue, as well as means to summon the rescue team, Golder will coordinate with the host facility rescue team for training and scheduling of entry work.



In situations where there are no professional rescue services within reasonable proximity to the site, Golder employees will be trained to perform all assigned rescue duties. These responsibilities include conducting and documenting actual simulated rescue drills a minimum of every 12 months. The drills must use either mannequins or actual persons and be conducted in the actual permit-space or from representative spaces with similar opening size, configuration and degree of accessibility. Rescue team members must be currently certified in CPR and First Aid. For all in-house rescue teams, an individual must be designated as responsible for equipment selection, inspection, and maintenance.

<u>NOTE</u>: Where professional rescue services are not available, Golder must provide one or two additional staff, depending on project conditions, for permit-entry sites. These additional staff will serve as the rescue team. The entry attendant will not participate in any entry-related rescue activities. If work inside the permit-space is being conducted using self-contained breathing apparatus (SCBA), which is Level B PPE, two rescue personnel identically equipped and trained to use SCBAs must be present on site.

16.0 EVALUATING PROGRAM EFFECTIVENESS

All cancelled permits will be retained for a minimum of 12 months and will be reviewed annually to determine if modifications to Golder's program are necessary to maintain safe entry into permit spaces. Performance of air monitoring equipment, PPE, and safety and retrieval systems will be reviewed by the entry supervisor with the HSC after each permitted entry. In the case of an accident or a near accident during any permit space entry, the HSC will investigate and correct the procedure as required to prevent similar future incidents.

Employee acceptance of this program, following procedures and using appropriate PPE and retrieval systems are integral to the program's success. Employee comments will be solicited regarding this program and the program amended, as needed

APPENDIX 1

ACKNOWLEDGMENT OF CONFINED SPACE TRAINING FORM

MINIMUM TRAINING REQUIREMENTS AND

ACKNOWLEDGMENT OF TRAINING PERMIT-REQUIRED CONFINED SPACE TRAINING

Topic Completion

Yes No No	General permit-required confined space	e hazards
Yes No No	OSHA 10 Construction Safety Training	
Yes No No	40 hour HAZWOPER Training	
Yes No No	Specific hazards associated with the si	te or facility
Yes No No	Proper use and limitations of atmosphe	eric testing equipment
Yes No No	Recognition of exposure hazards and s	ymptoms of over-exposure
Yes No No	Proper use and limitations of personal	protective equipment (PPE)
Yes No No	Explanation of Golder's permit system	and procedures
Yes No No	Emergency response procedures and s	self-rescue
Yes No No	Duties and responsibilities of entra	ants, attendant, and entry
Yes No No	Lockout/Tagout (optional)	
Yes No No	Hot Work (optional)	
Training Provided	by:	
Name	Signature	Date of
the topics indice practice using understand that training and I ag	training and information on permit-requiated above and have had the opportur all air testing instrumentation, safety it is my responsibility to follow the progree to abide by these safety procedure may result in disciplinary action.	nity to ask questions and to and rescue equipment. I because described to me in
Employee Name	Signature	Date

APPENDIX 2 CONFINED SPACE SURVEY FORM

Golder Associates	CONFINED SPACE SURVEY
Golder Project:	Survey Date:
Site Location:	
Description of Space:	
Can a person bodily enter the space to perform w	ork? Yes or No
Is the space intended for continuous he occupancy?	uman Yes □ or No □
Does the space have limited or restricted mea entry or exit?	ns of Yes or No
Note: If you answered all three questions "Ye	s" above, the space is considered to be a confined space.
Is this a confined space? Yes or No	
PERMIT REQUIRED CONFINED SPACES	
Does the space have an actual or potential hazar	dous atmosphere? If yes, describe below. Yes or No
Does the space contain liquid or finely divided so yes, describe below.	lid material that could engulf an entrant? If Yes ☐ or No ☐
Could the internal configuration (piping which lim narrow cross section or inwardly converging wa describe briefly below.	
Does the space have other known serious safety	or health hazards? If yes, describe below. Yes or No
Note: If you answered "Yes" to one or more Required Confined Space.	e of these questions, the space is considered to be a Permit-
Will Golder employees enter this space?	/es □ or No □
Does Golder have control over this space?	Yes ☐ or No ☐ If "Yes", please explain below:
Will clients or subcontractors enter this space?	∕es □ or No □
Methods to prevent unauthorized entry?	/es ☐ or No ☐ Lockable doors? ☐
Fences Lockable Covers Other, describ	e:
If entry cannot be completely prevented, what m clients, and subcontractors about hazards of this	
How will effectiveness of these methods be assest Describe:	ssed?

Can all physical hazards be evaluated and eliminated without entry into the space	e? Yes 📋 or No 📙
Can atmospheric hazards be assessed by remote testing?	Yes or No
Is it possible to certify that no actual or potential atmospheric hazard exists in tapace and that all hazards have been eliminated?	he Yes 🗌 or No 🗌
	be reclassified as a "Non-Permit"
Note: If the answer to all three questions above is "Yes", the space may confined space. If the answer to ANY of these questions is "No", consult w	
Note: If the answer to all three questions above is "Yes", the space may	
Note: If the answer to all three questions above is "Yes", the space may confined space. If the answer to ANY of these questions is "No", consult w	
Note: If the answer to all three questions above is "Yes", the space may confined space. If the answer to ANY of these questions is "No", consult we CERTIFICATION OF RECLASSIFICATION:	

APPENDIX 3 CONFINED SPACE ENTRY PERMIT

Go	lder ociates	co	NFINED SPA	CE ENT	RY PERMIT		
Project Number:			Purpose of Entry:				
Location:			Authorized Permit Date:				
Location of Confined Space:			Start Time:				
Type of Space:					End Time:		
EMERGENCY R	ESCUE INFO	ORMATION:	EQUIPMENT REQUIREMENTS (specify):				
Name of Service:			Respiratory Protection	res	Full fac spirator SCBA Emergency Other (spec	escape	
Address: Phone Number: Contact: Method of Contact:			Air Monito Equipment:	ring □	□Explosimeter/Multigas Meter □PID/FID □Draeger Tubes (specify) □Other (specify)		
Travel Time to Site: PERMIT SPACE	Protective Clothing:	Gle	Coveralls (specify type): Gloves (specify type): Boots (specify type):				
□ Oxygen Deficient <19.5% □ Oxygen Enriched >23.5% □ Skin Irritants □ Flammable Gases or Vapors □ Toxic Gases or Vapors □ Other (specify):			Other F (circle):	Pr	afety Glass otection pecify):	es Hearing Hard Hat Other	
		Skin Irritants Engulfment Hazards	Rescue Equipment:		Harness Hoist Other (spec	ify)	
		Communicat Equipment:	□ Cell phone □ Two-way radio □ Other (specify)				
ENTRY PREPAR	ADDITIONAL PERMITS REQUIRED						
□ Notify Affected □ Hazard Contro □ Lockout/Tago	ol Methods	☐Inerting ☐Purging/Cleaning ☐Barriers/Barricades ☐Atmospheric Testing	☐Hot Work ☐Line Brea ☐Other (spe	king			

Other (spec	cify):						
Authorized Enti	rant(s):	Authorized Entry Attendant:					
			Authorized Entry Supervisor:				
Communication	ns Procedures	(describe in de	etail):		1		
EXPLOSIMETI	ER CALIBRAT	ION					
Calibration Gas:					PERMIT	MUST BE PO JOB SITE.	STED ON
Time	Reading		Instrume	ent ID Number	GOOD	ONLY FOR IN	DICATED
						DATE.	DICATED
						it is valid for a	
						ns change in	
						area.)	
	COMPLETE	THIS FORM	WITH HEAL	TH AND SAFE	TY COORDII	NATOR	
Ventilation Sy	stem Require	ments:					
Volume of Con	fined Space (c	ubic feet):					
Blower Size:		SCFM		ime Required to air exchanges			
Ventilation Time:	Start						
		ATM	OSPHERIC	MONITORING			
	Acceptabl e			Resu	ılts		
Parameter	Conditions	Time:	Time:	Time:	Time:	Time:	Time:
Oxygen	>19.5%						
	<23.5%						
Flammability	<10% LEL						
Gasoline	300 ppmv						
Benzene	0.5 ppmv						
Carbon Monoxide	25 ppmv						
Carbon Dioxide	5,000 ppmv						
Hydrogen Sulfide	10 ppmv						
Methane	1,000 ppmv						

Other:										
Other:										
Testing Perform	Testing Performed By:			Signa		re:			Date:	
Authorization I	by Entry	Supe	ervisor:							
	I certify that all required precautions have been taken and that necessary testing, safety and rescue equipment is provided for safe entry and work in this confined space.							nd rescue		
Printed Name:					Sign	ature:				
Date:					Time	э:				
Entry Activity	Completion	on:								
The Permit-Required Confined Space entry conducted under the provisions of this entry permit has been completed. This Permit is hereby Cancelled.										
Printed Name	:				Sigi	nature:				
Date	:					Time:				



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work in the field in locations where there is potential inclement weather conditions to develop.

2.0 INTRODUCTION

Severe weather can occur at any hour of the day and any day of the year. Hurricanes, hailstorms, tornadoes, snowstorms, ice storms, wind storms, floods, severe cold, heat waves and drought occur daily.

2.1 TORNADOES/SEVERE WEATHER

Tornadoes are nature's most violent storms. They are most frequently reported east of the Rocky Mountains during spring and summer months. Peak tornado season in the southern states is March through May; in the northern states, it is late spring through early summer. Tornadoes are most likely to occur between 3 p.m. and 9 p.m., but can occur at any time.

Tornadoes generally occur near the trailing edge of a thunderstorm; however, it is not uncommon to see clear, sunlit skies behind a tornado. Some tornadoes are clearly visible, while rain or nearby low-hanging clouds obscure others. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible. Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Winds are generally in excess of 100 miles per hour but can be as high as 300 mph.

Whenever weather conditions develop that indicate tornadoes are expected, the National Weather Service issues a tornado watch to alert people in a designated area for a specific time period. The tornado watch is upgraded to a tornado warning when a funnel cloud is actually sighted. Tornadoes are often preceded by large hail, which follows shortly after the heavy rains and gusts from a thunderstorm have already passed.

What to do before a Tornado:

Be alert to changing weather conditions. If you see approaching storms or any of the danger signs, be prepared to take shelter immediately.

Look for the following danger signs:

- Dark, often greenish sky
- Large hail
- A large, dark, low-lying cloud (particularly if rotating)
- Loud roar, similar to a freight train.

Hazards and Possible Consequences:

Some of the hazards associated with tornadoes include:

- Lightning;
- High winds;
- Heavy rain; and
- Hail.

The most serious hazard caused by severe weather is lightning and heavy winds. The most serious hazard caused by tornadoes is from the force of violent wind strength and the fact that these same winds project dangerous debris through the air.

Secondary hazards include the following:

- Flash flooding;
- Electric power outages;
- Transportation-system and communication-system disruption; and
- Fires.

Control Measures:

Actions to be taken during severe weather include:

- If severe weather strikes without warning, take cover immediately.
- Seek shelter in designated shelters, basement, storm cellar, hallways or under furniture or other solid structure; or the lowest building level. If there is no basement, go to the center of an interior room on the lowest level away from corners, windows, doors, and outside walls. Put as many walls as possible between you and the outside.
- Remain calm. Do not run, push, or panic;
- Do not open windows:
- Do not use telephones except to report a site emergency;
- Use a battery operated radio in case of a power failure;
- Do not leave the shelter unless directed to do so by your Supervisor (if applicable); and
- Wait for the "All Clear" announcement, (30 minutes after last thunder/lightning event), if applicable.

2.2 HURRICANES

A hurricane is a type of tropical cyclone, the generic term for a low pressure system that generally forms in the tropics. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October. Hurricanes and tropical storms can also spawn tornadoes and microbursts, create storm surges along the coast, and cause extensive damage from heavy rainfall. Winds can exceed 155 miles per hour. Hurricanes are classified into five categories based on their wind speed,



central pressure, and damage potential. Category Three and higher hurricanes are considered major hurricanes, though Categories One and Two are still extremely dangerous and warrant your full attention.

Hazards and Possible Consequences:

- Hurricane Winds
- Rainfall and Flooding
- Storm Surge
- Tornadoes

3.0 COMMUNICATIONS

The Site Safety Officer will act as the Golder Incident Coordinator during all hurricane events. He/she will monitor the National Oceanic and Atmospheric Administration (NOAA) broadcasts and the instructions of local authorities. He/she will notify all facility site staff of the Hurricane status, Shutdown Orders, and Evacuation Orders.

If a hurricane is likely in your area, you should:

- Listen to the radio or TV for information.
- Secure the building, close storm shutters, and secure outdoor objects or bring them indoors.
- Turn off utilities if instructed to do so. Otherwise, turn the refrigerator thermostat to its coldest setting and keep its doors closed.
- Turn off propane tanks. Avoid using the phone, except for serious emergencies.
- Ensure a supply of water for sanitary purposes such as cleaning and flushing toilets. Fill large containers with water.

If you're at the site 36 hours before the predicted arrival of a hurricane:

- Survey site grounds and pick up all loose items and debris.
- Move all barricading materials, such as sandbags and plywood to areas where they will be installed.
- Notify contractors to secure their areas.
- Remove all trailers and scaffolding from site.
- Review hurricane preparedness plan with all personnel.
- Dismiss all site personnel.
- Secure vehicles as needed.
- Bring in outdoor equipment and anchor items that cannot be brought in.
- Close and board up windows.

4.0 WINTER STORMS

Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia. Some indicators of a winter storm are freezing rain, sleet, frost/freeze and blizzards.

Freezing Rain: Rain that freezes when it hits the ground, creating a coating of ice on roads, walkways, trees, and power lines.

Sleet: Rain that turns to ice pellets before reaching the ground. Sleet also causes moisture on roads to freeze and become slippery.

Blizzard: Sustained winds or frequent gusts to 35 miles per hour or greater and considerable amounts of falling or blowing snow (reducing visibility to less than a quarter mile) are expected to prevail for a period of three hours or longer.

Add the following supplies to your disaster supplies kit:

- Rock salt to melt ice on walkways
- Sand to improve traction
- Snow shovels and other snow removal equipment

Guidelines:

- Listen to your radio, television, or NOAA Weather Radio for weather reports and emergency information.
- Eat regularly and drink ample fluids, but avoid caffeine and alcohol.
- Conserve fuel.
- Maintain ventilation when using kerosene heaters to avoid build-up of toxic fumes. Refuel kerosene heaters outside and keep them at least three feet from flammable objects.

If you are outdoors:

- Avoid overexertion when shoveling snow. Overexertion can bring on a heart attack-a major cause of death in the winter. If you must shovel snow, stretch before going outside.
- Cover your mouth. Protect your lungs from extremely cold air by covering your mouth when outdoors. Try not to speak unless absolutely necessary.
- Keep dry. Change wet clothing frequently to prevent a loss of body heat. Wet clothing loses all of its insulating value and transmits heat rapidly.
- Watch for signs of frostbite. These include loss of feeling and white or pale appearance in extremities such as fingers, toes, ear lobes, and the tip of the nose. If symptoms are detected, get medical help immediately.



■ Watch for signs of hypothermia. These include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

If you are driving:

Drive only if it is absolutely necessary. If you must drive, consider the following:

■ Travel in the day, don't travel alone, and keep others informed of your schedule. Stay on main roads; avoid back road shortcuts.

If a blizzard traps you in the car:

- Pull off the highway. Turn on hazard lights and hang a distress flag from the radio antenna or window.
- Remain in your vehicle where rescuers are most likely to find you. Do not set out on foot unless you can see a building close by where you know you can take shelter. Be careful; distances are distorted by blowing snow. A building may seem close, but be too far to walk to in deep snow.
- Run the engine and heater about 10 minutes each hour to keep warm. When the engine is running, open a downwind window slightly for ventilation and periodically clear snow from the exhaust pipe. This will protect you from possible carbon monoxide poisoning.
- Exercise to maintain body heat, but avoid overexertion. In extreme cold, use road maps, seat covers, and floor mats for insulation. Huddle with passengers and use your coat for a blanket.
- Take turns sleeping. One person should be awake at all times to look for rescue crews.
- Drink fluids to avoid dehydration.
- Be careful not to waste battery power. Balance electrical energy needs the use of lights, heat, and radio with supply.
- Turn on the inside light at night so work crews or rescuers can see you.
- Leave the car and proceed on foot if necessary once the blizzard passes.



STANDARD WORK PROCEDURE SLIPS TRIPS AND FALLS

1.0 SLIPS, TRIPS AND FALLS

Over half of all office injuries are the result of falls. The majority of falls occur on slippery, uneven, defective, cluttered or obstructed walking surfaces. A significant number of debilitating falls are the result of a person falling out of his or her own chair, typically while in the process of sitting down, or leaning back. Falls from elevations while reaching for an overhead object are also common, and frequently cause severe injuries.

2.0 PRECAUTIONS WHEN IN THE OFFICE - HOUSEKEEPING

- Watch your step! Wipe up spilled liquids immediately. Tripping hazards such as defective floors, missing floor tiles, loose or matted carpeting, bunched-up floor mats, extension cords, phone cords, etc., should be corrected or reported and repaired immediately. Don't carry loads that are so large or bulky that the line of vision is impaired.
- Be careful when sitting down. Sitting on the edge of a seat, sitting too far back, or kicking the chair out from under one's self can result in a fall and fractured vertebrae. Occasionally check the mechanical condition of chairs commonly used.
- Be especially careful going up and down stairs. Avoid using stairs if both arms are loaded. Watch your step and if possible always have one hand free to use a railing. Maintain 3 points of contact when ascending/descending.

3.0 PRECAUTIONS WHEN OUT IN THE FIELD

In the field, falls are the second leading cause of work-related deaths.

4.0 TYPES OF FALLS

Falls are of two basic types: elevated falls and same-level falls. Same-level falls are most frequent, but elevated falls are more severe.

- Same-Level Falls: high frequency--low severity
- Elevated Falls: lower frequency--high severity

Same-level falls are generally slips or trips. Injury results when the individual hits a walking or working surface or strikes some other object during the fall. Over 60 percent of elevated falls are from less than 10 feet.

5.0 SAME-LEVEL FALLS

Examples of same-level falls are described below.

6.0 SLIP AND FALL

Slips are primarily caused by a slippery surface and compounded by wearing the wrong footwear. In normal walking, two types of slips occur. The first of these occurs as the heel of the forward foot contacts the walking surface. Then, the front foot slips forward, and the person falls backward.



STANDARD WORK PROCEDURE SLIPS TRIPS AND FALLS

The second type of fall occurs when the rear foot slips backward. The force to move forward is on the sole of the rear foot. As the rear heal is lifted and the force moves forward to the front of the sole, the foot slips back and the person falls.

The force that allows you to walk without slipping is commonly referred to as "traction." Common experience shows that dry concrete sidewalks have good traction, while icy surfaces or freshly waxed floors can have low traction. Technically, traction is measured as the "coefficient of friction." A higher coefficient of friction means more friction, and therefore more traction. The coefficient of friction depends on two things: the quality of both the walking surface and the soles of your shoes.

To prevent slips and falls, a high coefficient of friction (COF) between the shoe and walking surface is needed. On icy, wet, and oily surfaces, the COF can be as low as 0.10 with shoes that are not slip resistant. A COF of 0.40 to 0.50 or more is needed for excellent traction. To put these figures in perspective, a brushed concrete surface and a rubber heel will often show a COF greater than 1.0. Leather soles on a wet smooth surface, such as ceramic tile or ice, may have a COF as low as 0.10.



Figure 1. Shoes with soft rubber soles and heels with rubber cleats provide a high coefficient of friction (COF).

Providing dry walking and working surfaces and slip-resistant footwear are the answer to slips and their resultant falls and injuries. Obviously, high heels, with minimal heel-to-surface contact, taps on heels, and shoes with leather or other hard, smooth-surfaced soles lead to slips, falls, and injuries. Shoes with rubber-cleated, soft soles and heels provide a high COF and are recommended for most agricultural work.

In work areas where the walking and working surface is likely to be slippery, non-skid strips or floor coatings should be used. Since a COF of 0.40 to 0.50 is preferred for walking and working surfaces, we should strive for a surface which provides a minimum of 50 percent of this friction. If the working surface is very slippery, no footwear will provide a safe COF.

Trip and Fall Trips occur when the front foot strikes an object and is suddenly stopped. The upper body is then thrown forward, and a fall occurs.



STANDARD WORK PROCEDURE SLIPS TRIPS AND FALLS

As little as a 3/8" rise in a walkway can cause a person to "stub" his toe resulting in a trip and fall. The same thing can happen going up a flight of stairs: Only a slight difference in the height of subsequent steps and a person can trip and fall.

7.0 CONTRIBUTING FACTORS

Proper housekeeping in work and walking areas can contribute to safety and the prevention of falls. Not only is it important to maintain a safe working environment and walking surface, these areas must also be kept free of obstacles which can cause slips and trips. One method which promotes good housekeeping in work environments is the painting of yellow lines to identify working and walking areas. These areas should never be obstructed by objects of any kind.

Adequate lighting to ensure proper vision is also important in the prevention of slips and falls. Moving from light to dark areas, or vice versa, can cause temporary vision problems that might be just enough to cause a person to slip on an oil spill or trip over a misplaced object.

Carrying an oversized object can also obstruct one's vision and result in a slip or a trip. This is a particularly serious problem on stairs.

8.0 BEHAVIORS THAT LEAD TO FALLS

In addition to wearing the wrong footwear, there are specific behaviors which can lead to slips, trips, and falls. Walking too fast or running can cause major problems. In normal walking, the most force is exerted when the heel strikes the ground, but in fast walking or running, one lands harder on the heel of the front foot and pushes harder off the sole of the rear foot; thus, a greater COF is required to prevent slips and falls. Rapid changes in direction create a similar problem.

Other problems that can lead to slips, trips and falls are: distractions; not watching where one is going; carrying materials which obstruct view; wearing sunglasses in low-light areas; and failure to use handrails. These and other behaviors, caused by lack of knowledge, impatience, or bad habits developed from past experiences, can lead to falls, injuries, or even death.



1.0 SCOPE

This SWP applies to Golder Associates Inc. and Golder Construction Services (Golder) staff working on a project where groundwater sampling is conducted.

2.0 **DEFINITIONS**

Photo ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with an ultraviolet light source that ionizes organic vapors with ionization potentials less than that of the lamp.

Flame ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with a hydrogen flame that ionizes (through combustion) all combustible organic vapors.

3.0 KEY HAZARDS

- Chemical exposure via inhalation, skin contact or ingestion (See Chemical Exposure Risks SWP);
- Compressed gases for calibration (See Compressed Gases SWP);
- Heat or cold stress (See Inclement Weather, Heat Stress and Cold Stress SWPs);
- Lightning and high winds (See Inclement Weather SWP);
- Drilling (See Drilling SWP);
- Motor vehicles (See Motor Vehicles and Driving on Company Business SWPs);
- Slips, Trips and Falls (See Slips, Trips and Falls SWP);
- Electrical device hazards;
- Excavations (See Trenching and Shoring SWP);
- Working near or over water (See Working Over Water SWP);
- Heavy lifting and
- Insect Bites and Stings (See Biological Exposure Risks SWP).

If any of these hazards are anticipated on the project site, the corresponding SWP must be included in the Health and Safety Plan (HASP).

4.0 CHEMICAL HAZARDS

Groundwater sampling often involves using line-operated pumps to extract water from the subsurface. Ensure that the generator utilized is equipped with ground fault interrupter (GFI) circuitry to prevent possible shock hazards. Collect development or purge water in containers as required for proper disposal. Use secure areas for waste storage to protect the public and client staff from investigation derived waste (IDW). If internal combustion engines (generators) are used, they must be in an area with adequate ventilation, and free of combustible materials (i.e. dry grass, gasoline, etc.).





Keep your face as far from the opening of the well as possible to avoid inhaling volatile contaminants. Avoid any direct contact with a skin surface or eyes with groundwater. Continuous air monitoring should be performed utilizing a photo ionizing or flame ionizing instrument that can measure a minimum of 0.5 PPM organic vapor. Calibrate the air monitoring instrument daily as described in the literature provided. In general, total organic vapor readings of less than 1 PPM are safe. Steady breathing zone measurements at 1 PPM or above warrant engineering controls (ventilation) or personal protective equipment (respiratory protection) to reduce exposure. Concentrations in the well opening that exceed 500 PPM could indicate a large quantity of organic vapor, which poses not only a toxicity risk, but also a flammability risk. Wells with high organic vapor concentrations should be sampled carefully with a minimum of ferrous tools or other sources of ignition.

The site-specific Health and Safety Plan (HASP) addressing both known and reasonably anticipated hazards should be prepared prior to the commencement of work. Chemical hazards and their means of detection and control should be reviewed prior to field mobilization.

Maintain material safety data sheets (MSDS) or equivalent for all chemicals of concern at the site including any chemicals required as part of the sampling program (i.e. calibration gas, sample preservatives, etc.). Detailed chemical safety information can be found at www.osha.gov and www.cdc.gov/NIOSH.

5.0 PRECAUTIONS

Sampling groundwater often occurs at sites that contain known hazardous wastes are adjacent to similar sites. Follow all local regulations in regards to working at such properties.

This project presents construction related hazards such as trips, falls, and slips, and resulting injuries which are typical of undeveloped or industrial sites

- Wear proper footwear, including steel toes for earthwork;
- Clean boots and testing equipment, since slips may result from mud on a hard surface;
- Never jump across obstacles (i.e.: anchor trenches) and
- Do not walk on improvised plank bridges across ditches or anchor trenches unless they have been inspected by a competent person.
- Observe site traffic rules and right-of-way practices at all times. Heavy equipment and trucks should be assumed to have the right-of-way. Generally, the following rules apply to determining the right-of-way:
- Heavier equipment has the right-of-way.
- Loaded trucks and equipment have precedence over unloaded ones.
- Equipment moving down slope has precedence over one going upslope.
- Other general site vehicle operation rules are as follows:
- Observe speed limits within the site which usually do not exceed 15 miles per hour;



- Do not follow another vehicle too closely as material may fall off the vehicle or be thrown by the tires when in motion;
- Large equipment may have a significant "blind spot" on the right side of the vehicle. Avoid passing heavy equipment unless specifically instructed to do so by the operator of that equipment. Assume the equipment operator does not know you are present in an area and maneuver accordingly;
- Listen for and heed back-up alarms from heavy equipment and
- When possible, make eye contact with equipment operators.
- Park the company vehicle near the work location to mark your presence in the area. Wear high visibility clothing (reflective vests) to aid the operator in noticing your presence. Use extreme caution when operating in dusty conditions. Drive with your headlights on to increase your visibility. If conditions become dusty and significantly reduce visibility across the site, leave the area and wait for conditions to improve and contact the Golder Project Manager.
- Do not ride on the contractor's equipment, and do not attempt to operate any such equipment.
- Do not ride on anything that does not have a seat designed for human occupancy.
- Wear your seatbelt at all times when operating a motor vehicle.

Because monitoring wells may provide habitat for insects such as bees, spiders, and wasps, use caution when initially opening the well. When opening the well protective cover, open the cover and stand back for a few minutes to allow any flying insects an opportunity to leave. Prior to removing the well cap, inspect the inside of the protective casing to make sure no inhabitants are present.

6.0 MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard hat, as required
- Safety glasses (splash goggles should be made available depending on the known hazards that may be present in the groundwater)
- Respirator with appropriate cartridges, as required
- High visibility clothing (reflective vest)
- Steel-toed and shank safety boots
- Nitrile gloves (or appropriate gloves depending on the known hazards that may be present in the groundwater)

7.0 TRAINING

- 40-hour HAZWOPER or equivalent local requirement (8-hour annual refresher required).
- OSHA 10-hour Construction Safety
- Emergency First Aid/CPR Course
- Golder and/or site-specific training (including HASP review)

8.0 REFERENCES

29 CFR 1910.1000: Air Contaminants





- 29 CFR 1926.59: Hazard Communication
- 29 CFR 1926 Subpart E: Personal Protective and Life Saving Equipment



STANDARD WORK PROCEDURE WORKING AROUND HEAVY EQUIPMENT

1.0 SCOPE

This Standard Work Procedures (SWP) applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff visiting sites where heavy equipment may be in use. Such sites include surface and underground mines, remediation areas, and construction sites. Heavy equipment activity may change daily or hourly, with differing potential hazards that need to be identified and addressed.

2.0 KEY HAZARDS

- Hauling and dump trucks
- Shovels and draglines
- Excavators
- Bulldozers
- Mobile drill rigs
- Cranes
- Other mobile equipment, such as water trucks, graders, and pick-up trucks

One of the most important points to remember about working around any piece of heavy equipment is that the operator has a limited field of vision. Always make eye contact with the operator of the equipment prior to moving into swing/operating radius.

3.0 PRECAUTIONS

- Make arrangements-discuss protocols with the operator during daily tailgate meetings, at shift change, or when operators and/or operations change.
- Never approach an operational piece of heavy equipment until the operator is aware of your presence, your desire to approach, and signals the OK – where possible use radio contact.
- Stand in a safe location well outside the maximum extended reach of the shovel, dragline, or excavator arm, and out of the way of other mobile equipment. With an excavator, the optimum location is within the quadrant of the operator's visual coverage.
- When contact is made either by radio or visual contact, advise the operator of your wish to approach the equipment. The operator may want to complete a task prior to shutting down. If so, remain at the same location until the operator signals the OK to advance. Usually this will involve lowering the bucket to the ground; however practices may vary between sites. It is advisable to check with the site superintendent/foreman before entering areas where heavy equipment is in operation.
- Advise the operator of your task and requirements. Complete your task, advise the operator that you have completed your work, and depart the work area.



STANDARD WORK PROCEDURE WORKING AROUND HEAVY EQUIPMENT

4.0 SAFE DRIVING PRACTICES

- All pieces of haulage equipment and large mobile equipment will have the right-of-way on all roadways. All other equipment will give way and will keep a safe distance until the roadway is cleared.
- In areas of traffic congestion and narrow travel-ways, the smallest vehicle shall always yield to larger vehicles.
- When following heavy equipment, a safe travelling distance should be maintained at all times. The driver's side mirror should always be visible to you, and hence you to the operator.
- On the majority of operating surface mines, all traffic travels on the left-hand side of the road. However practices may vary between sites. Check with the site superintendent/foreman before travelling on site roadways.
- Overtaking hauling and dump trucks should be done only when the truck operator tells you to do so. Visual and/or radio contact must be made with the operator.

5.0 RESPONSIBILITIES

It is your responsibility to understand the traffic and equipment operating rules of the site. Ask the site superintendent/foreman for this information upon entering the site for the first time. This information should be reviewed during daily tailgate meetings.

6.0 MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard Hat
- Safety Boots
- High Visibility Vest
- Hearing Protection
- Safety Glasses



1.0 FIRE PROTECTION

All Golder offices will have an Emergency action plan (EAP) and within that plan will contain a Fire Prevention and Response Plan (FPRP). Every employee must review the EAP and FPRP to familiarize with emergency response and fire safety within that office. The plans contain the requirements for providing safety procedures, emergency contact information, evacuation routes, muster points, etc.

Golder employees outside of the office environment, traveling, performing work activities, and/or working on a job site who will be handling or near flammable materials, fueling/re-fueling, and/or transporting flammable materials shall review this Standard Work Procedure (SWP) for Fire Protection. All employees will be trained (see training section below), as required.

- Flammable materials are defined as any material which is easily ignited and capable of burning rapidly;
- Fueling is defined as to supply with any substance that is burned for heat or power, such as gasoline or diesel fuel.

2.0 KEY HAZARDS

- Mild to severe burns:
- Smoke inhalation (toxic fumes);
- Flammable gas, vapor or mist;
- Chemicals with the potential to cause acute or chronic health effects;
- Materials can become reactive or unstable over time.

3.0 PRECAUTIONS

To protect against fire, the following risk control measures must be adopted:

- Smoking is prohibited indoors and in all areas where flammable, combustible or similar hazardous materials are stored or used, except in any locations specifically provided for such purposes.
- Always be aware of the material you are working with, read the labels and MSDS. If there are still questions and/or concerns then contact any trained health and safety personnel.
- Ensure that the flammable substance is not of a sufficient quantity to create an explosive atmosphere if it is accidentally released.
- Always store flammable substances in accordance to OSHA regulations. The storage containers must be the prober container for the appropriate substance and must be properly labeled.
- Mechanized equipment must be shut down prior to and during re-fuelling operations.
- Do not talk on your cell phone during re-fuelling operations or near flammable substances that cause vapors, gasses, and/or mist.



- Closed systems, with an automatic shut-off that will prevent spillage if connections are broken, may be used to fuel diesel powered equipment that is left running.
- No re-fuelling activities will be conducted over water. When filling tanks for motor boats, the boat should be secured to the boat dock/jetty.
- All re-fuelling operations shall be performed in the appropriate manner, avoiding fire hazards from cigarettes, electrical equipment, hot metal surfaces, and other relevant hazards. All sources of ignition are prohibited in areas where flammable liquids are stored, handled or processed. Suitable NO SMOKING signs shall be posted in all such areas.
- Dispensing systems must be electrically bonded and grounded.
- Observe precautions during re-fuelling operations in hot weather as tanks and containers may become pressurized at elevated temperatures.
- Flashlights and electric lanterns used during handling of flammable liquids shall be of the types listed by the Underwriters Laboratories (UL), or other nationally recognized testing laboratory for use in such hazardous areas.
- Should the worker's clothing or skin become contaminated with the flammable material, it is imperative that the worker follow strict guidelines. The worker must change their clothing immediately, avoiding any sparks or open flames that exist or may be created. Once they have removed the contaminated clothing, they must ensure that it is decontaminated prior to using it again. If the skin in contaminated, it needs to be washed as soon as possible, keeping in mind the MSDS for the specific material.
- Internal combustion engines other than vehicles should be located outside of hazardous locations whenever possible, when flammable materials are present. This is due to the fact that vapors can cause flashback, and other serious concerns. If internal combustion engines are required to be in the hazardous location, they must be equipped with combustion air intake and a flame arresting device on their exhaust to diminish the fire hazard.
- Catalytic converters on the underside of vehicles are sufficiently hot to ignite dry grass. Employees should avoid driving over dry grass that is higher than the ground clearance of the vehicle, and be aware of the potential fire hazard posed by the catalytic converter at all times. Never allow a running vehicle to remain in a stationary position over dry grass or other combustible materials.
- Fire extinguishers and first aid kits are required for all field jobs and vehicles. Contact your Office Health and Safety Coordinator before the onset of travelling or the start of a project for the appropriate fire extinguisher for the task.
- Before any flame/spark producing activities, request a hot work permit from a controlling entity and follow all requirements as required.

4.0 EXTINGUISHER TYPES

When choosing the appropriate fire extinguisher, essentially two things need to be considered:

- The material you wish to protect;
- The type of extinguishing agent that will be most effective at suppressing the possible type of fire caused by these materials.

Fuel Source	Class of Fire	Type of Extinguisher (Extinguishing Agent)
Ordinary combustibles (e.g. trash, wood, paper, cloth)	А	Water; chemical foam; dry chemical*
Flammable liquids (e.g. oils, grease, tar, gasoline, paints, thinners)	В	Carbon dioxide (CO2); halon**; dry chemical; aqueous film forming foam (AFFF)
Electricity (e.g. live electrical equipment)	С	CO2; halon; dry chemical
Combustible metals (e.g. magnesium, titanium)	D	Dry powder (suitable for the specific combustible metal involved)

5.0 FIRE SUPPRESSION

For fire located in structures, portable fire extinguishers should only be used when:

- The fire is confined to a small area and is not growing.
- Everyone has exited the building.
- The fire department has been called or is being called.
- The room is not filled with smoke.

Vehicle fires also pose hidden dangers dependent upon what portion of the vehicle is involved. Typical watch outs around vehicles include:

- Most vehicles contain a wide range of synthetic materials that release toxic gases and substances that can easily be inhaled or absorbed through the skin by direct contact.
- Compressed gas cylinders/struts associated with hinge mechanisms under hoods, around hatch windows, bumpers, etc. present dangers.
- Airbags, electrical hazards, and cooling systems all present dangers.
- Magnesium components in the vehicles can react violently with the water.
- Beware the contents of vehicles (propane cylinders, calibration gas, gas cans, etc.).
- **Never** approach a burning vehicle directly from the front or rear.

6.0 EXTINGUISHER OPERATIONS



Only use a fire extinguisher compatible with the type of fire. When in doubt use an ABC fire extinguisher.

To operate a fire extinguisher, remember the word PASS:

- Pull the pin. Hold the extinguisher with the nozzle pointing away from you, and release the locking mechanism.
- Aim low. Point the extinguisher at the base of the fire.
- Squeeze the lever slowly and evenly.
- **S**weep the nozzle from side-to-side.

Allow the Fire Department to make the determination that a fire has been extinguished.

7.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE will vary from based on the activity and job requirements. However, when handling flammable material this additional PPE will be required:

- Gloves as specified in a chemical MSDS.
- Safety Glasses as specified in a MSDS.
- Approved container for storing flammable materials.
- Flammable retardant clothing, as required.

8.0 TRAINING

Every employee, as required, shall be trained in general principles of fire extinguisher use and the hazards involved in fire fighting before the job starts or any work activity begins. A refresher on fire protection shall be conducted at a minimum of once a year along with the EAP and FRPR. Additional training in handling, transporting, and/or identify flammable substances can include but not be limited to the following:

- OSHA 10 hour construction as required, as required
- HAZWOPER training, as required
- First Aid and CPR training, as required
- Site and chemical specific PPE training, as required

9.0 EXTINGUISHER INSPECTIONS

An inspection is a "quick check" to give reasonable assurance that a fire extinguisher is available, fully charged and operable. Inspections should always be conducted when extinguishers are initially placed in service and thereafter at approximately 30-day intervals. Remember to sign and date the inspection on the extinguisher tag.



10.0 EXTINGUISHER MAINTENANCE

Fire extinguishers should be maintained at regular intervals (at least once a year), or when specifically indicated by an inspection. Maintenance is a "thorough check" of the extinguisher by a trained professional and is intended to give maximum assurance that an extinguisher will operate effectively and safely. It includes a thorough examination and any necessary repair, recharging or replacement. It will normally reveal the need for hydrostatic testing of an extinguisher. A tag wired to the extinguisher should indicate the date of the extinguisher maintenance and who conducted the maintenance.

11.0 APPLICABLE OSHA REGULATION PARTS

The following are the major OSHA standards impacted by this work: 29 CFR 1910 Subpart E and Subpart L.



1.0 SCOPE

This Standard Work Procedure (SWP) applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on projects where hand or portable power tools may be utilized by Golder staff.

2.0 HAND AND PORTABLE POWER TOOL SAFETY

Hand and power tools are a common part of our everyday lives and are present in nearly every industry. These tools help us to easily perform tasks that otherwise would be difficult or impossible. However, these simple tools can be hazardous and have the potential for causing severe injuries when used or maintained improperly. Special attention toward hand and power tool safety is necessary in order to reduce or eliminate these hazards. In the process of removing or avoiding the hazards, workers must learn to recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent those hazards. The following risk control measures are suggested to reduce hazards associated hand and portable power tools:

2.1 General Safety Precautions

Employees who use hand and power tools and who are exposed to the hazards of falling, flying, abrasive and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases must be provided with the particular personal equipment necessary to protect them from the hazard. All hazards involved in the use of power tools can be prevented by following five basic safety rules:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job.
- Examine each tool for damage before use.
- Operate according to the manufacturer's instructions.
- Provide and use the proper protective equipment.

Employees and employers have a responsibility to work together to establish safe working procedures. If a hazardous situation is encountered, it should be brought to the attention of the proper individual immediately

2.2 Hand Tools

By definition, hand tools are non-powered. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples:

■ Using a screwdriver as a chisel may cause the tip of the screwdriver to break and fly, hitting the user or other employees.



- If a wooden handle on a tool such as a hammer or an axe is loose, splintered, or cracked, the head of the tool may fly off and strike the user or another worker.
- A wrench must not be used if its jaws are sprung, because it might slip.
- Impact tools such as chisels, wedges, or drift pins are unsafe if they have mushroomed heads.
- The heads might shatter on impact, sending sharp fragments flying.

The employer is responsible for the safe condition of tools and equipment used by employees but the employees have the responsibility for properly using and maintaining tools. Employers should caution employees that saw blades, knives, or other tools be directed away from aisle areas and other employees working in close proximity. Knives and scissors must be sharp. Dull tools can be more hazardous than sharp ones.

Appropriate personal protective equipment, e.g., safety goggles, gloves, etc., should be worn due to hazards that may be encountered while using portable power tools and hand tools. Safety requires that floors be kept as clean and dry as possible to prevent accidental slips with or around dangerous hand tools.

Around flammable substances, sparks produced by iron and steel hand tools can be a dangerous ignition source. Where this hazard exists, spark-resistant tools made from brass, plastic, aluminum, or wood will provide for safety.

3.0 POWER TOOL PRECAUTIONS

Power tools can be hazardous when improperly used. There are several types of power tools, based on the power source they use: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

Employees should be trained in the use of all tools - not just power tools. They should understand the potential hazards as well as the safety precautions to prevent those hazards from occurring.

The following general precautions should be observed by power tool users:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- All observers should be kept at a safe distance away from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. The worker should not hold a finger on the switch button while carrying a plugged-in tool.



- Tools should be maintained with care. They should be kept sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance.
- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- All portable electric tools that are damaged shall be removed from use and tagged "Do Not Use."

4.0 ELECTRIC TOOLS

Employees using electric tools must be aware of several dangers; the most serious is the possibility of electrocution.

Among the chief hazards of electric-powered tools are burns and slight shocks which can lead to injuries or even heart failure. Under certain conditions, even a small amount of current can result in fibrillation of the heart and eventual death. A shock also can cause the user to fall off a ladder or other elevated work surface.

To protect the user from shock, tools must either have a three-wire cord with ground and be grounded, be double insulated, or be powered by a low-voltage isolation transformer. Three-wire cords contain two current-carrying conductors and a grounding conductor. One end of the grounding conductor connects to the tool's metal housing. The other end is grounded through a prong on the plug. Anytime an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong should never be removed from the plug.

Double insulation is more convenient. The user and the tools are protected in two ways: by normal insulation on the wires inside, and by a housing that cannot conduct electricity to the operator in the event of a malfunction.

These general practices should be followed when using electric tools:

- Electric tools should be operated within their design limitations.
- Gloves and safety footwear are recommended during use of electric tools.
- When not in use, tools should be stored in a dry place.
- Electric tools should not be used in damp or wet locations.
- Work areas should be well lighted.



5.0 REGULATORY CITATION

OSHA 29 CFR 1910 Subpart P - Hand and Portable Powered Tools and Other Hand-Held Equipment. General requirements: Each employer shall be responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees.



STANDARD WORK PROCEDURE HEARING PROTECTION

1.0 SCOPE

This Standard Work Procedures (SWP) applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working in high noise environments.

2.0 DEFINITION

Noise induced hearing loss is an insidious, debilitating disease. Employees are advised of the potentially harmful effects of excessive noise and should make every effort to limit their exposure both at work and at home. Although noise-induced hearing loss is one of the most common occupational illnesses, it is often ignored because there are no visible effects, it usually develops over a long period of time, and, except in very rare cases, there is no pain. What does occur is a progressive loss of communication, socialization, and responsiveness to the environment.

Work-related hearing loss continues to be a critical workplace safety and health issue. Noise-induced hearing loss is preventable, but once acquired, hearing loss is permanent and irreversible. Prevention measures must be taken by employers and workers to ensure the protection of workers' hearing.

3.0 HAZARDS

Golder provides earplugs and/or earmuffs to all employees who work where peak noise levels may exceed 85 dB(A) Unless specific noise readings are available to demonstrate otherwise, noise levels near heavy equipment, drill rigs, pile drivers, concrete coring devices, etc. should be assumed to exceed 85 dB(A). Employees shall use the issued hearing protection devices when in any of the following situations:

- When work area safety requirements include hearing protection;
- When working in an area of steady state (continuous) noise that interferes with normal speech between individuals who are standing at a distance of three feet apart;
- When working in an area of any impact noise (such as driving casing or piles) where the noise is loud enough to cause discomfort;
- When in areas where signs are posted requiring hearing protection; and
- When noise levels measured with a properly calibrated sound level meter exceed 85 dB(A).

4.0 POSSIBLE CONSEQUENCES

Permanent hearing loss or impairment can result from prolonged exposure to noise at levels above 85 dB(A) on an 8 hour TWA basis. Hearing loss or impairment can also result from shorter exposures at higher sound levels.



STANDARD WORK PROCEDURE HEARING PROTECTION

5.0 TRAINING, MEDICAL MONITORING, AND RECORD KEEPING

Employees required to work in areas where peak noise levels may exceed 85 dB(A) will be provided with appropriate training regarding hearing conservation before commencing work in these areas. Training will include addressing ambient conditions, as well as changed conditions. Refresher training will be provided as conditions change, or, at a minimum, on an annual basis. Records of training will be maintained in the employee's personnel file, as required in 29 CFR 1910.95 and 1910.120.

All Golder technical employees participate in the company's medical monitoring program. The medical monitoring program consisting of regular, periodic physical examinations including audiometric testing in accordance with 29 CFR 1910.95 and 29 CFR 1910.120(f). Prior to beginning employment with Golder, all new employees complete a pre-employment physical examination (at no cost to the prospective employee) that, among other items, establishes the baseline audiogram for the employee. In the event that a standard threshold shift is determined during a regular, periodic audiogram, the employee will be notified within 21 days of the determination. In addition, employee work habits, PPE and site situations will be evaluated to determine what alternative hearing conservation methods would be appropriate. This evaluation will be conducted in consultation with a qualified medical professional.

Medical monitoring results (including audiograms) are provided to the employee after completion of the physical examination and evaluation of the data by Golder's occupational medical physician. Audiogram results are retained by Golder with the employee's medical monitoring records for a period of time in accordance with the provisions of 29 CFR 1910.95(m) and 1910.1020(d).

6.0 CONTROL MEASURES

- Where reasonable and practicable, Golder will reduce the worker's exposure to high noise situations through the use of engineering, and administrative controls. Should these controls not be sufficient or effective, PPE will be used to protect the worker.
- Employees shall complete a hazard assessment prior to starting work in an area of high noise, to ensure that all hazards are accounted for, and the appropriate PPE is utilized. Employees shall comply with all ear plugs/muffs manufacturer's guidelines, and government standards regarding ear protection.
- Noise levels will be monitored at regular intervals throughout the work period to ensure worker safety. If the noise monitoring confirms excessive noise at a worksite, sound level measurements will be used to evaluate the efficacy of the planned PPE. In the event that planned PPE will not provide sufficient hearing protection, the site safety contact will consult with the office or regional Health and Safety Coordinator to develop an alternative approach to protect worker hearing.
- PPE will be inspected prior to the start of work each day to ensure that the PPE is functioning as designed, and if the PPE is in anyway compromised, it is replaced. Hearing PPE will be provided by Golder at no cost to the employee.



STANDARD WORK PROCEDURE HEARING PROTECTION

7.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Ear plugs (Compliant with ANSI S3.19-1974.)
- Ear muffs (Compliant with ANSI S3.19-1974.)

8.0 JOB STEPS & PRECAUTIONS

- Workers shall read and understand the SWPs regarding Hearing Protection and Personal Protective Equipment.
- A hazard assessment will be completed prior to work commencing to determine the hazards as well as the PPE required for a site.
- PPE will be inspected daily to ensure it is in good working order.

9.0 REFERENCES

- 29 CFR 1910
- 29 CFR 1926
- ANSI S3.19



STANDARD WORK PROCEDURE HOUSEKEEPING

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff who are responsible for housekeeping activities in their workplace; in the office or on a project site. The benefits of good housekeeping far exceed the small additional effort required to establish good housekeeping practices.

2.0 HOUSEKEEPING IN THE OFFICE

- Tools, extension cords, fans, furniture, and loose materials should be located so as not to cause tripping or other hazards. Any tools, materials, and/or equipment subject to displacement or falling must be adequately secured.
- All walkways, stairways, access ways must be kept free of materials, supplies and obstructions at all times. Be alert to tripping hazards. If you see one, correct it.
- Pencils, scissors, letter openers should never be stored in a cup or holder with sharp ends pointed outward.
- Do not store loose knives, razor blades, or other sharp objects in desk drawers.
- Wear rubber "thimbles" when working extensively with files to avoid paper cuts.
- Always use the right tool for the job.

3.0 HOUSEKEEPING ON THE PROJECT SITE

- Tools, extension cords, hoses, and loose debris/materials should be located so as not to cause tripping or other hazards. Any tools, materials, and/or equipment subject to displacement or falling must be adequately secured.
- If you ever have a "close call", chances are that the incident is indicative of an accident waiting to happen and that sooner or later someone (maybe you) will get hurt. Note and report all "near misses" as per Near Miss Incident Report Form (Goldnet).
- Site conditions, vegetation, roadways, pathways must be maintained.
- Collect all waste generated by your work activities daily, and disposal in appropriate containers at the end of each day. Schedule appropriate pick-up and disposal as needed;
- Consolidate and minimize all waste materials, including investigation derived waste (IDW) on a daily basis. Schedule appropriate disposal as needed.
- Although, the overall safety of a construction site is the ultimate responsibility of the general contractor who maintains the site safety plan and communicates its information to all of the subcontractors on site, every worker on the site is responsible for safety. It's every worker's responsibility to know and following the site safety plan, practice good housekeeping, follow recommended work practices, and promptly report and/or correct hazards at the worksite.



STANDARD WORK PROCEDURE HOUSEKEEPING

- Keep the Golder worksite free of unnecessary clutter and debris that could cause an injury or accident. Limit the amount of materials and chemicals onsite to the quantities that you will need. Place trash and debris in the proper receptacles located throughout the job site. Remove combustible materials such as wood and paper from the site promptly.
- Keep storage, staging, and work areas, along with all stairs and walkways on the construction site, free of obstructions, and debris. Store tools and materials neatly and out of the way in storage bins or lockers and keep flammable or hazardous wastes in covered, segregated waste containers. Ensure that materials stored on roofs or at heights are secured. Never throw waste, materials, or tools from a building or structure.

4.0 REGULATORY CITATION

OSHA 1910.22 states that all places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition. The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained and false floors, platforms, mats, or other dry standing places should be provided where practicable. To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.



STANDARD WORK PROCEDURE CELLULAR TELEPHONE USE

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on Company-Related Business.

2.0 GUIDELINES FOR CELLULAR TELEPHONE USE

Cellular telephones are considered a vital communication link between field personnel, contractors and clients. Their most important function is to allow us to check in with the office, communicate when we need assistance, and/or provide information from a remote location. Cell phones also represent a significant risk to users if they are not used with due care and attention. Statistics have shown significantly higher accident rates by drivers using cell phones (whether or not they have hands-free). It is not acceptable to endanger your health and safety or the safety of others by distracting attention from the task at hand to respond to a telephone call.

3.0 DEFINITIONS

<u>Company Driver</u> – Any Employee of the Company who is operating a Company Vehicle at any time; or, any Employee who operates his/her Personal Vehicle on Company-Related Business.

<u>Company-Related Business</u> – Any act performed by Employees that is within the scope or the duties of employment for which the Employee was engaged by the Company. This definition does not include an act committed during an Employee's employment which is not in the ordinary course of Company's business or not within the scope of the Employee's workplace authority. Generally, operating one's Personal Vehicle from home to work and back does not constitute Company-Related Business.

<u>Company Vehicle(s)</u> – Any vehicle owned, leased, rented and/or insured by the Company. For the purposes of this Policy, this also includes any vehicle that has been rented or leased in either the Company's or the Employee's name.

<u>Operating a Motor Vehicle</u> –A person "operates" a motor vehicle when, while in the vehicle, they make use of any mechanical or electrical system that alone or in sequence sets the vehicle in motion. If the vehicle is parked in a designated parking space and turned on for the purpose of cooling or heating, this does not constitute "operating a motor vehicle".

4.0 CELLULAR TELEPHONE USE DURING PROJECT WORK

Golder's Motor Vehicle Policy prohibits the use of cellular telephones while operating a motor vehicle for Company-Related Business. All employees must comply with Golder's Motor Vehicle Policy effective October 16, 2009.



STANDARD WORK PROCEDURE CELLULAR TELEPHONE USE

If your phone rings, no matter what your activity, first consider if the distraction of answering the phone may place you or others in danger. If it does present a hazard, do not answer the phone. The caller can call back or leave a message on your voice mail.

When appropriate, return the call after you have moved to a safe location on the project site that is away from heavy equipment, moving vehicles, and other hazardous conditions. Frequently information from a call must be written, and the act of transcribing information to a notebook reduces your visual connection with project site hazards.

Do not walk around the project site when you are talking on your cell phone. Stand in one place during the call. If you must move to another location, terminate the call, move to the other location, and reestablish the call.

For staff routinely in the field, we recommend you silence your phone when you are on the project site. You can look at your phone when you have time and return the calls when it is safe.

5.0 CELLULAR TELEPHONE USE WHILE DRIVING

The use of Portable Electronic Devices by a Company Driver in a Policy-Covered vehicle is prohibited while Operating a Motor Vehicle. The Portable Electronic Devices may remain in the "on" mode while Operating a Motor Vehicle. Texting, emailing, surfing the internet, and using headphones are prohibited. Employees are strongly discouraged from performing other activities that result in taking away meaningful attention to operating a vehicle safely (e.g., eating, reading, applying makeup, shaving, etc.). Portable GPS units are allowed, if permitted by applicable local law and client policy, but the units must not obscure forward vision.

Employees are required to comply with all telephone and pager use policies imposed by a Client when traveling or performing services on Client's projects.



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) Company Drivers who operate Company Vehicles or who operate their personal vehicles on Company-Related Business.

2.0 MOTOR VEHICLES AND DRIVING ON COMPANY-RELATED BUSINESS

Unlike other workplaces, the roadway is not a closed environment. Preventing work-related roadway crashes requires strategies that combine traffic safety principles and sound safety management practices. Although employers cannot control roadway conditions, they can provide safety information to workers and set and enforce driver safety policies to promote safe driving behavior. Vehicle crashes are not an unavoidable part of doing business.

All employees must comply with the Golder Motor Vehicle Policy effective October 16, 2009. The terms in this SWP are defined in that Policy.

3.0 GENERAL GUIDELINES

- Enforce mandatory seat belt use. Seat belts shall be worn by all drivers and passengers in vehicles on company business.
- Must carry appropriate insurance if using private vehicles for work purposes.
- Consider the risks driving while fatigued presents on all projects. Do not require workers to drive irregular hours or far beyond their normal working hours.
- Develop work schedules that allow employees to obey speed limits and to follow applicable hours-of-service regulations.
- Observe all the rules and regulations pertaining to the use of public land. Always ask permission before crossing pastoral land. Leave gates as you find them. Keep to constructed vehicle tracks. Avoid areas that are easily damaged, such as swamps, alpine snow plains and vegetated sand dunes.
- Observe all fire restrictions.
- Refer to the Cell Phone Safe Work Procedure for more information.

4.0 VEHICLE MAINTENANCE AND FLEET MANAGEMENT

- Adopt and enforce a structured vehicle maintenance program for Golder-owned vehicles.
- Maintain Vehicle Condition Check-out/Check-in list for Golder-owned vehicles.
- Test the brakes, wipers, tires, lights, and turn signals, and verify that the vehicle has an inflated spare tire and jack prior to use (in company, private, or rented vehicles). Address any notes or oral warnings concerning vehicle deficiencies, which must be remedied at the earliest possible opportunity. If any safety concerns are identified, the vehicle must not be used.
- Report vehicle deficiencies to the Office Manager as soon as they are noticed. The Office Manager, or his/her delegate, will arrange for maintenance of the vehicle.



- Equip Golder-owned, rented, or private vehicles used for on-site work with fire extinguishers and first aid kits, if required.
- Ensure rented or client-provided vehicles are in a roadworthy condition.

5.0 SAFETY PROGRAMS

- Teach workers strategies for recognizing and managing driver fatigue and in-vehicle distractions.
- Provide appropriate training to workers operating specialized motor vehicles or equipment.
- Emphasize the need to follow safe driving practices on and off the job.
- Consider fire safety when parking vehicles in areas with dried grasses, leaves, or other plant material. Hot engine fluids, catalytic converters or other vehicle equipment could ignite dry plant material, and cause a fire.

6.0 DRIVER PERFORMANCE

- Make sure each driver of a vehicle being used on company business (company owned, private, or hired) possesses a valid driver's license that is appropriate for the type of vehicle to be driven.
- Check driving records of prospective employees, and perform periodic rechecks after hiring.
- Maintain complete and accurate records of workers' driving performance.

7.0 SECURING LOADS

Unsecured and poorly secured items inside or outside of a vehicle can be extremely dangerous if they are loose or become airborne. They can harm the vehicle driver and passenger, and/or occupants in vehicles behind you. The following recommendations should be followed:

- Use tie-down straps that are in good condition and rated for the load you will carry. Ratcheting tie downs are better than bungee cords or tie downs that just pull tight
- Install mounts to secure loads that you haul frequently in the same vehicle or trailer.
- Secure tarps covering loads so they are snug and do not flap.
- Check your load after you have driven a short distance to make sure it has not shifted.
- Do not pile items higher than the side walls of the truck bed or trailer.

8.0 VEHICLE SAFETY EQUIPMENT

You may not know when a highway emergency will happen, but you can be prepared by ensuring that your vehicle is equipped to deal with roadside emergencies. Consider carrying items such as the following, and know how to use them properly:

- Flashlight
- Reflective safety vest



- Light sticks
- Fire extinguisher
- Tire inflator or sealant
- Reflective triangles or flares

9.0 DRIVING TECHNIQUES FOR 4-WHEEL DRIVING

9.1 Driving In Heavy Vegetation

- Get out and check road conditions before proceeding if you are unsure of the ground ahead, especially if there is mud or water.
- Position your hands on the steering wheel so that your thumbs are on the outside the steering wheel.
- Do not change transmission gears in the middle of a hazardous area, if in doubt always choose the lower gear.
- Tire pressures play an important part in off-road driving. Lowering tire pressures helps in getting through. 140-180 kPa (20-26 psi) is a good tire pressure for soft tracks. If you choose to use a lower tire pressure, the vehicle must be operated at a lower speed. Remember to re-inflate your tires as soon as you're back on hard ground.
- Cross small ridges 'square on' and cross ditches at a slight angle.
- Turn the steering wheel from side to side to maintain traction and move forward if you begin to lose traction going uphill, along a rutted track, or in mud.

9.2 Driving On Steep Hills

- Use low second or third gear for going uphill and low first gear for going downhill.
- Use the footbrake sparingly and with caution.
- Avoid turning the vehicle sideways on a hill. If the vehicle begins to slide sideways, very slightly accelerating and steering into the slide will normally straighten your descent.
- Allow any vehicle in front of your vehicle plenty of room
- Do not touch the clutch or accelerator if you stall going uphill.

9.3 Sand Driving

- Speed and flotation are the keys to success. High transmission gear ratio is best, if possible.
- Lower the tire pressure to 20 psi. If you choose to use a lower tire pressure, the vehicle must be operated at a lower speed. Remember to re-inflate your tires as soon as you are back on hard ground.
- Drive in existing wheel tracks if they are present.
- Avoid sudden changes in direction or acceleration. Coast to a stop if possible.
- Approach dunes head on.
- Avoid braking when descending a dune. Point the front of the vehicle downhill. Do not go fast, but also do not go so slow that the wheels stop rolling, or the vehicle begins to slide sideways. A touch on the throttle will keep the wheels moving and the vehicle pointing in the right direction.



- Try to rock the vehicle backwards or forwards, building up a small stretch of hardpack sand that you can accelerate from if the vehicle gets stuck. Do not spin the wheels!
- Be sure that recovery gear is always in the vehicle in these driving conditions.
- Wash the vehicle after use.

9.4 Snow, Rain, and Ice Driving

- Carry chains and install them on the tires when required.
- Prepare your vehicle and carry safety gear.
- Travel only on roads and tracks that are open to traffic.
- Drive with low beam lights on. Do not travel when visibility is poor.
- Vehicles travelling uphill in snow and ice conditions have right of way.
- Park only where directed and as close to the bank as possible. When parking, leave the vehicle in gear. Do not use the handbrake it could freeze in the "on" position.
- Lift the wiper blades off the wind shield when leaving the vehicle parked.
- Watch for other travelers and animals and drive slowly in areas where they may be present. In the event that an animal is encountered on a road where driving conditions are poor due to the presence of snow, ice, or rain, do not over steer to avoid hitting the animal. The act of over steering may cause the vehicle to slide or roll. Most of the time the animal will move out of the road before the vehicle reaches it.
- Consider increasing the load or weight on the rear axle of front-wheel drive vehicles to improve traction when driving in snow, ice, or rain.

9.5 Driving in Mud

- Good tires with deep tread are helpful when driving in muddy conditions.
- Low second or third are probably the best gears for vehicle operation.
- Move the steering wheel rapidly from side to side to improve traction.
- Keep a steady pace.
- Stay out of ruts if possible.
- Rock the vehicle backwards or forwards by alternating between first and reverse if you do become stuck.

9.6 Driving in Fog/Limited Visibility

- Drive with low beam lights on. Do not travel when visibility is poor.
- Drive slowly and carefully.
- Pull over to a safe location if you can not see vehicles in front or behind you until weather improves.

10.0 REGULATORY CITATION

There are no Federal OSHA regulations relating to driving safety. The Department of Transportation (DOT) Title 49 (Transportation) Subtitle VI (Motor Vehicle and Driver Programs) provides information about commercial motor vehicle operations.



STANDARD WORK PROCEDURE WORKING ON OR OVER WATER

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work on or over water.

2.0 WORKING ON OR OVER WATER

Over or near water work is undertaken by many different groups within the Golder for various activities including: barge drilling, geophysics, piling and inspection, dredging, aquatic sampling, and transport are some of the more common uses of over-water vessels, and this work can occur over lakes, rivers, and in marine environments.

Over water work introduces an additional level of danger to other procedure(s) that may be covered by other safe work procedures (SWPs). If this is the case, the health and safety issues discussed under that procedure's heading are also relevant, and should be referred to. As a result of the additional complication associated with over water work, increased levels of alertness, caution, and diligence are required.

If working on a boat, the crew MUST file a "FLOAT PLAN" with the appropriate office prior to departure (see last page of this SWP).

3.0 KEY HAZARDS

- Falling overboard, drowning
- Falls or slips associated with wet surfaces or rough water
- Overturning or capsizing due to improperly loaded or overloaded vessels
- Collisions with other vessels or debris
- Seasickness
- Weather Changes
- Hypothermia

4.0 PRECAUTIONS

- Only trained and qualified persons should operate the controls of boats or barges. For all work carried out over water, the owner, either Golder or sub-contractors, will be responsible for the safe operation, maintenance and general sea-worthiness of the vessel.
- Workers are required to wear an approved Personal Floatation Device (PFD) that is sufficiently buoyant to keep the workers head above water. This does not apply in situations where either the depth of water is too shallow to allow the PFD to function properly, or a sufficient fall protection system has been implemented to prevent falls



STANDARD WORK PROCEDURE WORKING ON OR OVER WATER

into the water. Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jacket or buoyant work vests. PFDs should provide thermal insulation if work is in cold climate.

- All buoyancy and lifesaving equipment is to be marked with reflective material, including PFD's (should have whistle and/or light beacon if used on vessel), life rafts, lifeboats, and buoys. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used. If needed, ring buoys with at least 90 feet of Floating (nylon) line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- In addition, if needed, at least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.
- If a boat is to be used for the transportation of workers, it is required to be conspicuously marked with a safe maximum load, a safe maximum horsepower (if equipped with an outboard motor in excess of 10 HP), and that it be marked with a loading water line to make overloading apparent.
- Required safety equipment includes: first aid supplies, and readily available fire extinguisher(s).
- Deck lighting or spotlights/floodlights are to be used to ensure all work areas on board are sufficiently illuminated to enable work to be carried out safely.
- A radio or other method of communication with a land based station is required. If the vessel is in excess of 5.5 m (18 ft.) in length, an Emergency Position Indication Radio Beacon (EPIRB) is required for locating the vessel in the event of an accident.
- For stationary vessels (i.e. Barges), anchor points must be placed in a safe manner to prevent long anchor lines from being snagged and dragged by other vessels. All anchor points are to be well marked with buoys, and attachment points to shore are to be similarly well marked.
- Obtain as much site-specific information as possible concerning tidal/river conditions, known navigational hazards, and water depths. This is essential if you are operating the vessel and generally useful if you are working with a contractor owner/operator. Service clearance is also required, underwater/underground cables and pipelines may be present in the area.
- Use available and up to date tidal and marine charts, check weather forecasts and conditions for the area of interest, and determine what traffic may be present (barges, log booms, freighters, ferries, etc.). Verify weather, visibility and tidal conditions prior to embarking.
- The operator of a boat is responsible for operating his/her vessel within the safe maximum load, and any posted power limits or speeds. In addition, the operator is responsible for ensuring that all passengers are provided with an approved PFD.

5.0 MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

High Visibility Personal Floatation Device (PFD) if required *



STANDARD WORK PROCEDURE WORKING ON OR OVER WATER

6.0 FILING A FLOAT PLAN

Before going out on a vessel it is always a good idea to leave a float plan with a local marina, relative or friend. A float plan should:

- Describe the vessel, its number, size, make, capacity, horsepower, and type of engine.
- List where you are going, the route, and your expected return time.
- Give the number of passengers, their names and addresses, and a contact in case of an emergency.

1.	Name of person reporting and telephone number
	()
2.	Description of boat Type Color Trim Registration No Length Name Make Other
3.	Engine type H. P No. of engines Fuel capacity
4.	
5.	Radio 🗖 Yes 🗖 No Type Frequency
6.	
7.	Automobile license number Type Trailer license Color Make of auto Where parked
	Where parked
8.	Persons on board Name Age Address & Telephone
9.	Do any of the persons on board have a medical problem? ☐ Yes ☐ No If yes, what?
10.	
	Expect to return by (time) am D pm and not later than D am D pm
11.	Any other pertinent information?
12.	If not returned by (time) call the Coast Guard or (local authority) am D pm
13.	



STANDARD WORK PROCEDURE TRAFFIC SAFETY

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on projects with active uncontrolled traffic conditions (e.g., in street/highway right-of-ways).

2.0 TRAFFIC SAFETY

Traffic control is required whenever the uncontrolled movement of vehicle traffic could be hazardous to workers. Working on projects with active uncontrolled traffic conditions (e.g., in street/highway right-of-ways) can be very dangerous or even life threatening without the proper safety controls, awareness, and signage. Golder's project manager and site safety officer should develop a traffic control plan that will meet local, state, and federal regulations to ensure the safety of Golder personnel.

3.0 TRAFFIC CONTROLS

3.1 Non-Lane Closure

These traffic controls or actions are intended to protect Golder personnel without using lane closures or restricting traffic flow. Examples of non-lane closure activities include working at commercial properties (e.g., retail petroleum stations) or observing rock slopes in a right-of-way. Best management traffic control procedures include one or more of the following practices:

- Performing work within traffic areas at off-peak hours, if possible;
- Placing orange reflective cones and caution tape around the designated work area;
- Placing high-visibility signs to warn drivers of designated work areas;
- Placing your vehicle between you and oncoming traffic;
- Wearing high-visibility safety apparel, including high visibility vest intended to provide visibility during both daytime and nighttime (Note: must meet the Performance Class 2 or 3 requirements of the ANSI/ ISEA 107–2004)
- Wearing safety glasses to prevent dust or other debris from entering your eyes;
- Parking your vehicle behind the Jersey barrier or guardrail and exiting your vehicle on the opposite side of traffic;
- Turning on your vehicle's flasher lights and/or a roof-mounted flashing amber light;
- Always face traffic if possible;
- Be prepared for inclement weather and know how this may impact your work area (e.g., rain may create slippery driving conditions);
- When not engaged in the work (e.g., taking notes, talking on your cell phone, breaks) stand in a safe area behind the guard rails or Jersey barriers; and
- Reducing and/or eliminating the number of times you cross the road.



STANDARD WORK PROCEDURE TRAFFIC SAFETY

3.2 Lane Closure

The *Manual on Uniform Traffic Control Devices* (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on streets and highways. This resource should only be used as a reference.

Federal Highway Administration (FHWA) publishes MUTCD under 23 Code of Federal Regulations (CFR), Part 655, Subpart F. This resource should only be used as a reference.

Golder personnel should implement the following guidelines on projects where the fieldwork must be performed within traffic closures or lane restrictions. (The guidelines described herein have been prepared under the assumption that the set-up and control of the traffic closure is provided by an appropriately trained person or traffic control subcontractor. Traffic control procedures must meet the requirements of the local Department of Transportation (DOT) and/or local Police Department.). Golder personnel should also follow the best management traffic control procedures listed above during lane closures and/or lane restrictions.

- Make sure a Golder representative has in their possession a copy of all local, state, and federal permits to perform the lane closure and/or lane restriction;
- Field staff participating in the project must attend an orientation meeting with the person or representative of the traffic control company in charge of the lane closure or restriction (e.g., altering the traffic pattern) to discuss the particulars of each traffic closure/restriction set-up and safety requirements. Traffic closure or restrictions should only be set up by suitably trained and qualified individuals. Traffic controls must meet the requirements of the local DOT and/or Police Department requirements;
- Any work vehicle within the traffic closure or entering the work zone shall have its four-way flashers on or be equipped with a roof-mounted flashing amber light;
- Until all traffic control safety measures are in place, only the members of the field staff involved in the lane closure set—up will be allowed on-site. In the case where an outside firm is providing the lane closure, no staff shall be allowed within the closure until the closure is complete;
- Workers within the closure area must be within communicating range of each other. Two-way radios should be used when the workers are not within talking range of each other;
- In cases where equipment, noise and/or obstructions limit a worker's audible or visual cues to danger from traffic, a lookout person shall be stationed in these work areas to monitor traffic and signal the workers if a potential dangerous conditions arises;
- Be aware of construction equipment operating within the lane closure area;
- If working at night, understand that the bright lights from the construction area may decrease, confuse, or blind the oncoming drivers;



STANDARD WORK PROCEDURE TRAFFIC SAFETY

- Use extreme caution when exiting and entering a lane closure (i.e., getting within the "safe" zone of the traffic closure). Allow enough time to safely accelerate your vehicle to match traffic speeds and provide enough warning and distance to drivers behind you to safely decelerate your vehicle to enter the lane closure area; and
- The worker should face the on-coming traffic and position themselves away from traffic to the extent possible.

4.0 MINE TRAFFIC SAFETY

Golder personnel working at active mines must follow the Site-specific Health and Safety Plan prepared in accordance with Mine Safety & Health Association (MSHA) regulations.

5.0 REFERENCES

- American National Standard for High-Visibility Safety Apparel and Headwear", ANSI/ISEA 107-2004.
- Manual on Uniform Traffic Control Devices (MUTCD), Federal highway Administration (FHWA), 23 CFR Part 655, Subpart F.



APPENDIX C

MONSANTO SODA SPRINGS PLANT

HEALTH AND SAFETY

PROCEDURES

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11 SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.0 Table of Contents

Requirement Number	Title
6.1.0	Contractor Management Systems
6.1.1	Emergency Response
6.1.3	Training
6.1.4	English Proficiency
6.2.0	Working in an Operating Unit
6.2.1	Office Safety
6.3.0	Housekeeping
6.3.1	Basic Environmental, Safety and Health Rules
6.3.2	Personal Protective Equipment
6.3.5	Injury and Illness Recordkeeping and Reporting
6.3.7	Hand Tools
6.3.8	Scaffolding
6.3.9	Stairways and Ladders
6.3.10	Abrasive Blasting
6.3.11	High Pressure Water Blasting
6.3.12	Welding, Cutting and Brazing
6.3.13	Slings, Chain falls and Come-Along
6.3.14	Compressed Gas Cylinders

6.0 Table of Contents

Monsanto Internal



6.0 Contractor/Guest ES&H Site Guidelines

6.0 Table of Contents

Requirement Number	Title
6.4.0	Fire Protection and Prevention
6.4.4	Monsanto Security Policy
6.5.1	Confined Space Entry
6.5.3	Lockout and Tagging
6.5.4	Electrical Safety
6.5.5	Hot Work Permit
6.5.7	Trenching and Excavation
6.5.9	Fall Protection
6.6.2	Hearing Conservation
6.6.3	Respirator Protection
6.6.4	Hazard Communication
6.6.5	Asbestos Abatement
6.6.7	Lead Exposure
6.6.8	Radiation Safety
6.7.1	Cranes and Hoisting Equipment
6.7.3	Mobile/Powered Construction Equipment
6.8.0	Waste Management
6.9.1	Substance Detection



5.1.0 Contractor Management System

5.1.0.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1926 Subpart C General Safety & Health Provisions

5.1.0.1 Monsanto General Requirements

- 1. Contractors shall provide, when specified by the Certified Monsanto Representative (CMR), the services of a full-time safety representative.
- 2. Contractors' safety representatives shall:
 - a. As a minimum, be certified as having taken the 30-Hour OSHA Construction Standards Course, or equivalent.
 - b. Manage the contractor's project safety program and will interface directly with the CMR.
 - c. Report directly to the contractor's corporate safety manager.
 - d. Have the authority to correct any hazard or unsafe practice on the project, even if a work stoppage is required.
- 3. The selection of a contractor's safety representative shall be approved by the CMR. Contractors shall provide to the CMR verification that the selected individual meets all the requirements set forth by Management.
- 4. Contractors shall have available at the job location employees who are qualified as competent persons. Contractors shall provide documentation demonstrating those employees' qualifications to perform as a competent person to the CMR.

5.1.0.2 Definitions

1. Competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Site Requirement *6.1.0

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.1.1 Emergency Response

5.1.1.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1910 Subpart L Fire Protection
 - b. 29 CFR 1926 Subpart C General Safety and Health Provisions

5.1.1.1 Monsanto General Requirements

- 1. Contractors shall comply with all location emergency response procedures, severe weather and evacuation plans.
- 2. All employees shall be trained in emergency procedures at the time employees receive their initial orientation. Contractors shall make all employees aware of the location alarm system code signals, public address announcement system, appropriate responses and how to engage the emergency response system at the location. Physician, hospital, ambulance and location emergency telephone numbers shall be conspicuously posted at the work site.
- 3. Contractors shall establish an evacuation and severe weather plan for the project location. Contractors' evacuation plans shall be coordinated with the location evacuation plan. A site plan showing evacuation routes and shelter locations shall be conspicuously posted at the work site.
- 4. In the event of an emergency, dial the location emergency number (or use other means as specified by the location) and give the responder the following information:
 - a. Name of person calling
 - b. Telephone number
 - c. Location of the emergency
 - d. Nature of the emergency

NOTE: Do not hang up. Maintain open communication until instructed otherwise.

5. Contractors shall provide emergency response equipment, such as fire extinguishers, personal protective equipment, etc., as necessary for the work site and the work being performed.

5.1.1.2 Definitions

1. Emergency: May include spills and releases, fire, explosion, bomb threat, severe weather conditions, and major injury or illness.

Site Requirement *6.1.1

Revision Date: 12/01/09

Next Revision Date: 12/01/11
Revision: 2



5.1.3 Training

5.1.3.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1926 Subpart C General Safety and Health Provisions

5.1.3.1 Monsanto General Requirements

- 1. Contractors shall train their employees in accordance with any specific additional training requirements noted in each of the individual Section 5 documents.
- 2. Contractors shall maintain records of all employees' safety training.
- 3. Employee safety training records shall contain:
 - a. Name and signature of the employee
 - b. Date of training
 - c. Subject and content of the training
 - d. Means used to verify that employee understood the training
 - e. Name of the instructor
- 4. Monsanto reserves the right to require the contractor to submit copies of employee safety training records as a pre-condition to permitting the employee(s) to perform work on Monsanto property. Alternatively, Monsanto may require contractor employees satisfactorily demonstrate knowledge and understanding of the training required in 5.1.3.0 through administration of a simple written questionnaire or test as a pre-condition to permitting the employee(s) to perform work on Monsanto property.
- 5. Contractors shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury

6. The above requirements pertain to any subcontractors engaged by the (prime) contractor. It will be the (prime) contractor's responsibility to insure that all subcontractors they engage comply with these requirements.

Site Requirement *6.1.3

Revision Date: 12/01/09
Next Revision Date: 12/01/11
Revision: 3



5.1.4 English Proficiency

5.1.4.0 Monsanto General Requirements

- 1. The environmental, safety and health process shall be administered in English consistent with the Contractor/Guest Environmental, Safety and Health Policy. Orientation, training, comprehension evaluation, application of environmental, safety and health procedures, such as: work permit procedures, job planning and any other processes or procedures related to working safely are included.
- 2. Contractor companies will be expected to staff the work to be done with personnel that can meet this requirement.
- 3. If the English deficiency is caused by a physical or mental disability, ADA rules will apply.

5.1.4.1 Application of Requirements to Specific Job Situations

- 1. Communication in English is required only when and to the extent necessary to conduct the assigned work safely.
- 2. Non-safety related activity, such as lunch breaks, are not covered by the requirement.
- 3. Communication on-the-job in another language is allowed if, for example, all persons directly involved in the work at the time communicate more effectively in that language.
- 4. The term communication covers the English language skills necessary for the person to receive and understand information, and to deliver information as required by the safety process.
- 5. Accent and grammar are not a consideration unless these preclude effective communication with others.

5.1.4.2 Exceptions to the Requirement

1. Exceptions to this requirement may be granted under certain conditions. When the pool of English speaking workers becomes unable to fulfill resource requirements. The Certified Monsanto Representative (CMR) must submit a written request for an exception. The exception must include reasonable accommodations that will allow for the safety of all Monsanto employees and other contractor employees affected by the use of non-English speaking workers. Both the CMR Leader and Site Manager must approve, by signature, the written exception.

Site Requirement *6.1.4

Revision Date: 12/01/09 **Next Revision Date: 12/01/11**Revision: 3



5.2.0 Working In Our Units and Facilities

5.2.0.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1910 Subpart H Hazardous Material

5.2.0.1 Monsanto General Requirements

- 1. Contractors shall not access, or perform any work on, operating process or equipment in our units or facilities unless specifically directed by the Certified Monsanto Representative (CMR).
- 2. When construction work is performed in an operating unit or facility:
 - a. Employees shall sign in at the control room when entering the unit, or as specified by the location.
 - b. Construction work shall be coordinated with operating unit supervision or site management.

5.2.0.2 Training Requirements

- 1. Contractor employees who perform process and manufacturing operations work shall be trained in the operation and maintenance of miscellaneous machines and equipment they will work with prior to starting work.
 - a. When contractors are not able to train their employees in the operation or maintenance of miscellaneous machines and equipment, the CMR or Competent Person shall perform the required training.

2. Contractor employees who perform process and manufacturing operations work shall be certified in accordance with location operator certification requirements for the specific work performed.

Site Requirement *6.2.0

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.2.1 Office Safety

5.2.1.0 Monsanto General Requirements

- 1. Areas occupied to perform clerical or office type duties shall be purposefully established for the use.
 - a. Desks, chairs, file cabinets and tables shall be manufactured for the
 - b. Work areas shall be designed for proper ergonomics of the individuals assigned to the area.
 - c. Work areas shall be equipped with glare free lighting of the proper intensity for the work activity being performed.
- 2. The following items, while not intended to be all inclusive, are indications of some of the areas of concern for good office safety:
 - a. Never leave unattended file cabinet or desk drawers open.
 - b. Do not open more than one file cabinet drawer at a time.
 - c. When moving office equipment, use proper lifting techniques and solicit help when the item is too heavy for one person to carry.
 - d. Do not lay electrical cords across aisles or walkways.
 - e. Do not use extension cords or adapter plugs to provide additional electrical outlets. Wire new outlets permanently.
 - f. Replace or repair all frayed electrical cords and defective electrical equipment.
 - g. Do not climb or stand on furniture.
 - h. Do not attempt to repair office machinery unless specifically trained to make the repairs.
 - i. Disconnect the power supply to office machines when making adjustments or reloading the magazine.
 - j. Keep work surfaces free of unnecessary clutter.
 - k. Do not overload desks, shelves or file cabinets.

5.2.1.1 Training Requirements

- 1. Employees shall be trained in the use and simple maintenance of office machines they will use prior to starting work.
- 2. Employees who will perform repairs to office machines and equipment shall be properly trained for the specific machines to be repaired.

Site Requirement *6.2.1

Revision Date: 12/01/09
Next Revision Date: 12/01/11
Revision: 3



5.3.1 Basic Environmental, Safety and Health Rules

5.3.1.0 Governmental Requirements

- 1. Contractors shall comply with all federal, state, county, and municipal or local safety laws bearing on their work.
- 2. Contractors shall comply fully with all applicable requirements of the Contract Work Hours and Safety Standards Act and the Occupational Safety and Health Act and the rules and regulations promulgated thereunder. Contractor's attention is specifically directed to 29 CFR, Chapter XVII, Part 1926, "Safety and Health Regulations for Construction", and Part 1910, "General Industry Safety and Health Regulations".

5.3.1.1 Monsanto General Requirements

1. Contractor employees shall be responsible for their actions and the impact their actions have on others. Safety shall be a condition of employment. Rules shall be reviewed in Pre-Bid meetings and the Site Orientation with all contractor personnel prior to work.

Site Requirement *6.3.1

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.3.5 Injury and Illness Recordkeeping and Reporting

5.3.5.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses

5.3.5.1 Injury and Illness Recordkeeping

- 1. Contractors shall have responsibility for maintaining injury and illness records for their employees.
- 2. Monsanto will maintain a summary of OSHA Recordable Incident Information for contractors/guests.

5.3.5.2 Injury and Illness Reporting

- 1. Contractors shall immediately notify the Certified Monsanto Representative (CMR) of any occupational injury, illness, loss of or damage to management property, or spill and release, including all subcontractors and material suppliers under contractor control.
- 2. Contractors shall provide the CMR with a copy of the Employer's First Report of Injury or Illness (or such other similar report required by federal, state, county and municipal or local safety laws) for each job-related injury or illness to an employee. This report must be provided as soon as possible after the occurrence of an incident and according to location requirements.

5.3.5.3 Incident Analysis

- 1. The analysis process for potentially serious incidents, injuries, and illnesses shall be conducted as specified by the CMR. Procedures to be followed should include:
 - a. The first concern at an incident is care of the injured. Nothing should interfere with this except the safety of the rescuers themselves.
 - b. After the site is safe to approach, the analysis should begin.
 - c. Preserve the scene by protecting or barricading the area to prevent disturbance of evidence.
 - d. Conduct a walk-through of the incident site. Take notice of and record the location of all items of evidence. Mark the location of items likely to be moved.
 - e. Obtain the identity of all people who might have information about the incident. Record their names, crafts and company worked for.
 - f. Examine the evidence. Items that will provide information about what happened, how it happened and why it happened must be identified and examined. Photographs of the accident site and the items of evidence should be taken as soon as possible after the incident.
 - g. Make a diagram of the incident site. A sketch should be made showing the location of all evidence essential to understanding the incident situation. Distances should be measured and recorded on the sketch.
 - h. Interview all witnesses and obtain statements from them. Persons who may be able to contribute information about the incident should be interviewed as soon as possible after the incident, and recorded statements should be obtained from them.
 - i. A written report shall be prepared for all serious incidents. The report should include:
 - Incident description what happened, when it happened and who was involved
 - The root causes
 - Management and/or program deficiencies
 - Identification and implementation of corrective action to prevent a recurrence
 - Definition of accountabilities and timetables for corrective action
 - A designee to follow-up the corrective actions
- Incident and job-related injury data are maintained and periodically reviewed
 to determine the most serious and frequent causes. Appropriate actions to
 address the causes are implemented.

- 3. Immediately upon completion of a formal analysis report, copies shall be issued to those people designated by the CMR.
- 4. Contractors and the CMR shall maintain copies of all incident reports on file.

 $\begin{array}{lll} \text{Site Requirement} & *6.3.5 \\ \text{Revision Date:} & 12/01/09 \\ \textbf{Next Revision Date:} & \textbf{12/01/11} \\ \text{Revision:} & 4 \\ \end{array}$



5.4.4 Security

5.4.4.0 Monsanto General Requirements

- Monsanto Tier One facilities, as classified by Monsanto's Security Vulnerability Assessment (SVA), shall require the contractor to perform a background check on all employees and sub-contractor employees. Background checks will be conducted at the discretion of each site that is not classified as Tier One by the SVA.
- 2. The American Chemistry Council Guidance on Conducting Background Checks is the guidance document used by Monsanto to develop each site's background check requirements.
- 3. Contractor employees shall enter and leave the location only through the entrance specified by the Certified Monsanto Representative (CMR).
- 4. All persons visiting the location shall be registered at their entry and exit points in accordance with location requirements.
- 5. Contractor employees shall wear location-required identification (badge, pocket insert, sticker) at all times when on the location.
- 6. Cameras may be brought into and used only in compliance with the location requirements.
- 7. Routes for contractor employees through the location to the work site will be designated by the CMR. Contractor employees should remain in the particular area in which they are working.
- 8. Contractors shall comply with specific location conditions or additional security regulations.
- 9. Firearms of any type shall not be permitted except under special authorization from the CMR.

10. Contractors shall be responsible for the security of all materials, tools and equipment, whether owned by the contractor, rented by the contractor or loaned to the contractor by the CMR.

Site Requirement *6.4.4

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.9.0 Occupational Medicine

5.9.0.0 Governmental Requirements

- 1. Contractor shall comply with the requirements of the following:
 - a. 29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses (1904.0 1904.46)
 - b. 29 CFR 1926 Subpart D Occupational Health and Environmental Controls
 - c. 29 CFR 1910 Subpart K Medical and First Aid
 - d. Where applicable and depending on Job Scope and Requirements:
 - 29 CFR 1910 Subpart I Personal Protective Equipment (1910.134 Respiratory protection)
 - 29 CFR 1910 Subpart G Occupational Health and Environment Control (1910.95 Occupational noise exposure)
 - 29 CFR 1910 Subpart H Hazardous Materials (1910.120
 Hazardous waste operations and emergency response)
 - 29 CFR 1910 Subpart Z Toxic and Hazardous Substances
 - 29 CFR 1910.1001 Asbestos
 - 29 CFR 1910.1025 Lead
 - 29 CFR 1910.1030 Bloodborne pathogens
 - 29 CFR 1910.1048 Formaldehyde
 - 29 CFR 1926 Subpart D Occupational Health and Environmental Controls (1926.62 – Lead and 1926.65 – Hazardous waste operations and emergency response)
 - 29 CFR 1926 Subpart Z Toxic and Hazardous Substances
 - 29 CFR 1926.1101 Asbestos
 - 29 CFR 1926.1148 Formaldehyde
 - e. Contractors shall provide employee access to his or her personal medical records in accordance with the provisions of the following:

 29 CFR 1910 Subpart Z – Toxic and Hazardous Substances, 1910.1020 Access to employee exposure and medical records.

5.9.0.1 Monsanto Requirements

- 1. As applicable and per elements in this section, the Contractor shall comply with the requirements of the following from Monsanto Fundamental Requirements in Occupational Medicine (excerpts from these documents are included herein):
 - a. R35 Qualifications and Responsibilities of the OM Professionals Supporting Company Sites
 - b. R40 Pre-placement/Transfer Health Assessments
 - c. R42 Medical Leaves and Return to Work Assessments
 - d. R43 Exit Health Assessments
 - e. R45 Medical Surveillance for Hearing Conservation
 - f. R46 Respirator Medical Surveillance
 - g. R52- Bloodborne Pathogen Employee Protection

5.9.0.2 Monsanto General Requirements

- 1. Contractors shall provide for medical services that can evaluate and maintain the health of their employees in accordance with applicable governmental requirements.
- 2. Equipment shall be provided within the work area for quick drenching or flushing of the eyes and body for immediate emergency use if accidental exposure to corrosive materials occurs.
- 3. Contractors shall provide the Monsanto Representative with a copy of written procedures describing the content and delivery of medical services to their employees, including:
 - a. The name of the provider of the services
 - b. The professional qualifications and licensure status of the provider and staff
 - c. Medical surveillance required by governmental regulations and standards and as required by Monsanto.
- 4. Contractors shall provide applicable health and safety examinations for employees.
- 5. Contractors shall monitor their employee's exposure to chemical agents and physical stresses to ensure compliance with governmental medical

- surveillance requirements. When Monsanto chemicals or agents are involved in contractors' work, the Monsanto Representative will provide notice to the contractor for their compliance with medical surveillance requirements.
- 6. Contractors shall medically evaluate employees on return to work after an occupational injury or illness that occurred at a location. A physician's written opinion shall be obtained on the ability of the person to safely resume his or her designated duties.
- 7. The contractor is responsible for planning emergency response and transport for their employees. Monsanto employees at the location will assist with contractor emergency care only to the extent and level of proficiency acquired through certified training.
- 8. By prior arrangement with contractors, location management may authorize location medical personnel to provide non-emergency medical treatment to contractor employees to enable such employees to remain at work without interruption and time loss. All occupational injuries and illnesses dealt with in this manner shall be recorded by contractors in their medical logs.
- 9. When the contractor is a self-employed person (individual consultant), or is an employee of an employment agency who is assigned to duties on the location without supervision (for example clerks, temporary secretaries and laboratory technicians), the location will provide first aid or emergency medical treatment for all occupational injuries and illness.
- 10. If an individual is assigned to duties which require mandatory medical clearance (for example use of hearing protection, respirators, etc.) the contractor company or self-employed contractor is responsible for obtaining such examinations, and must advise location management of any restrictions which apply.

5.9.0.3 Medical Surveillance Programs

1. The listing below includes chemical/physical agents and situations for which occupational health surveillance is presently required. This listing could be changed periodically as appropriate by the Monsanto Department of Medical and Health Sciences (DMHS). This surveillance may be required by regulation and therefore legally mandated. In addition, there are exposures for which no legally enacted standard mandates surveillance, but for which Monsanto requires periodic health evaluation. Occupational health surveillance is targeted to specific at-risk groups as by workplace assignment, known exposure history and/or workplace monitoring data and

conducted by performing certain specific health examinations to include the following:

- a. Contractors, with the assistance of the Certified Monsanto Representative (CMR), shall identify potential health hazards or work conditions that may require medical surveillance examinations, and provide them to affected employees as required by governmental requirements. Some examples of medical surveillance examinations that are commonly required for performing work on Monsanto premises are:
 - Asbestos
 - Blood-borne Pathogens
 - Benzene
 - Cadmium
 - DMAC
 - Formaldehyde
 - Hazardous Substances Emergency Response
 - Hearing Conservation
 - Lead
 - Ionizing Radiation
 - Respiratory Protection
 - Hazardous Waste Operations and Emergency Response (HazWOpER)
- 2. Pre-placement health examinations shall be provided for contractor employees who are employed in jobs for which Monsanto required/legally mandated health examinations would be performed for its full-time employees (if they were to perform the job) and who:
 - a. Are, or may, be potentially exposed at or above the action level (i.e., one-half the eight-hour time-weighted average permissible exposure limit or Monsanto workplace exposure guideline) to a chemical/physical agent and situations as identified above; and
 - b. Are anticipated to work in a designated exposure area for 30 or more consecutive workdays or where non-consecutive work periods may result in sufficient cumulative work exposure to warrant evaluation. Such work evaluations will be conducted by Monsanto Industrial Hygiene in consultation with Occupational Medicine, DMHS, as to what constitutes sufficient cumulative work exposure; or
 - c. Regardless of work duration, are assigned to a job for which Industrial Hygiene, in consultation with Occupational Medicine, determines sufficient potential exposure to require health examinations.

- d. When there is any question as to whether or not the job assignment requires special health surveillance or any question as to the specifics of the health examination, Occupational Medicine, DMHS, is to be consulted and is the final authority.
- 3. This section is not intended to apply to potential exposures that might result from possible catastrophic events not reasonably foreseeable.
- 4. Where "baseline" medical data on contractor employees are required prior to working in area, sufficient lead-time for collection and analysis of samples is required in scheduling work.
- 5. Examinations are to be performed by qualified healthcare professionals and per applicable governmental regulations and requirements. Examination may be performed by healthcare professionals, identified by contractors, who meet the Monsanto Fundamental Requirement for Occupational Medicine R35 Qualifications and Responsibilities of the OM Professionals Supporting Company Sites or the approval of Monsanto DMEH.
 - Surveillance health examinations for contractor employees shall follow as closely as possible the examinations as defined for Monsanto employees.
 - b. The minimum overall qualifications for occupational medicine professionals include:
 - Formal training and completion of courses from a nationally or internationally recognized institution of education,
 - Fully licensed and able to practice under local, state and country laws,
 - No license suspensions or involuntary revocations in any state or country,
 - Compliance with Company fundamental requirements and ethical standards.
 - Fulfillment of continuing education for licensure and professional certifications,
 - Participation in local, state, and national professional associations,
 - Knowledge and skills related to the prevention and recognition of occupational disease, epidemiology, toxicology, ergonomics, worksite risk evaluation, disability, health surveillance, counseling,
 - Local labor and occupational medicine regulations

- c. More details information is in the applicable Fundamental Requirements for Occupational Medicine listed under Section 5.9.0.1 Paragraph 1.a. (above). Contact the CMR for more information or a copy of the Fundamental Requirement.
- 6. Periodic and exit physicals for contractor employees shall be in accordance with the same frequency/ timing practices provided for Monsanto employees similarly situated.
- 7. Maintenance and storage of medical record information on contractor employees will be at the discretion of the location and will follow the same policies regarding confidentiality and retention as for Monsanto employees. In all cases, whether the examination is performed on or off location, a copy is to be accessible to Monsanto medical personnel or be maintained by Monsanto in the same area as the medical records for that location are maintained. Where feasible, Monsanto forms are to be used.

Site Requirement *6.9.0
Revision Date: 12/01/09
Next Revision Date: 12/01/11
Revision: 3



5.9.1 Substance Detection

5.9.1.0 Monsanto General Requirements

- 1. Contractors classified as Low-Risk:
 - Contractors that are performing Low-Risk work are not required to have a substance abuse policy, unless required by the Monsanto location.
 - b. If the Certified Monsanto Representative (CMR) suspects a low risk contract employee is impaired due to alcohol, drugs or other substances, the contract employee will be asked to immediately leave the Monsanto location.

2. Contractors classified as High-Risk:

- a. Contractors performing High-Risk work shall comply with the location substance abuse policy established for contractors.
- b. Contractors shall have a documented program to assure that contract employees who work on Monsanto property are not impaired due to alcohol, drugs or other substances.
- c. In the event contractors are unable to provide either initial verification of drug-free employees or the location's required testing, the CMR may arrange for such services by or through Monsanto, but at the contractor's expense.
- d. Contractors shall provide the CMR with a summary of testing data on request.
- e. When an employee tests positive for substance impairment in required testing or is suspected of substance impairment, contractors shall:
 - Inform the CMR
 - Immediately remove the employee from the location

f. An employee who has tested positive for substance impairment shall not be allowed to return to any Monsanto location until the CMR has been provided verification and documentation that the employee has successfully completed a recognized substance abuse rehabilitation program.

Site Requirement *6.9.1

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 4



5.9.2 Ergonomics

5.9.2.0 Governmental Requirements

General Duty Clause

Hazardous conditions or practices not covered in an OSHA standard may be covered under Section 5(a)(1) of the Occupational Safety and Health Act of 1970 which states: "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

5.9.2.1 Monsanto General Requirements

Contractors **should** have an Ergonomics Program in place that addresses, as a minimum, the following elements:

- 1. Provisions that address the specific control method for the ergonomic hazards present in the workplace.
- 2. A mechanism for reporting injuries/illnesses, symptoms, and hazards which may be related to ergonomics in the workplace, and for responding to such reports.
- 3. A process for evaluating the nature and causes of injuries/illnesses which may be related to ergonomics in the workplace and a process for identifying, implementing, and evaluating measures to reduce injuries/illnesses.
- 4. An element that demonstrates the program's provisions are effective in reducing the number and severity of workplace injuries/illnesses related to ergonomics of the number of ergonomic hazards.
- 5. A training component making employees aware of the ergonomics program and all if its key elements.



5.0.0 About This Document

5.0.1 Purpose

1. The purpose of this document is to convey Monsanto's corporate ES&H Guidelines to vendors, guests, contractors and persons carrying out activities on Monsanto property.

5.0.1 Introduction

1. The safety of all people working at Monsanto facilities is our top priority. The vision and goal of Monsanto is to create an incident and injury free workplace. This incident and injury free workplace cannot be attained without the same vision and commitment from each and every contractor and person working at our facilities. The Monsanto Contractor and Guest Environmental Safety and Health Guidelines provide a framework from which to work toward this goal. These guidelines must be strictly adhered to. Our safety philosophy and goals are intended to promote a team approach, foster a proactive attitude and work having a common goal, an incident and injury free workplace.

5.0.2 OSHA Standards, ANSI and Other References

1. A variety of Standards are referenced throughout this document. Although it is our intention to maintain this document as "evergreen" it must be noted that it is the responsibility of the contractor or person/s using this document to follow stated standards in their most current release, form or version.

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 0

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them. Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11 DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11 SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Guidelines

6.1.0 CONTRACTOR MANAGEMENT SYSTEMS

Contractors shall provide a full time Safety Representative in the following conditions:

- a.) When the contract company has 10 or more employees on site.
- b.) If they have less than 10 employees but the job has been defined as a high-hazard job through and ESH review, or if required by the Contractor Safety Specialist.
- c.) The full-time Safety Representative shall:
 - Have a minimum of three years experience in construction safety and have passed the OSHA 30 Hour Construction Course.
 - Must have Accident/Incident Investigation Skills
 - In some incidences, First Aid/CPR certification.
- d.) The Safety Representative shall be responsible for all subcontractors, and to ensure they are following ESH requirements.
- e.) The Safety Representative's primary responsibility will be to continuously monitor the contractor's personnel, the contractor's subcontractor personnel and equipment to ensure compliance with all applicable ESH requirements.
- f.) If the Safety Representative does not demonstrate the ability to perform his/her work to the satisfaction of the Monsanto Representative, the Monsanto Representative may ask that this person be replaced by another Safety Representative meeting the criteria listed above.
- g.) The Safety Representative must have the authority to correct any hazard or unsafe practice on the project, even if a work stoppage is required.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.1.1 EMERGENCY RESPONSE

Purpose:

This plan provides for the immediate organization of all efforts to prevent injury to personnel, damage to property and the environment, and to ensure accountability of employees.

Scope:

The plant Emergency Plan shall be used for any abnormal incidents that may occur inside of the Soda Springs Site including, but not limited to, personnel injury, or serious property or environmental releases, which have the potential to impact the surrounding community.

General:

Plant emergencies can be reported to PROVOX operators by dialing 777 on any plant telephone or by using plant radios.

The Plant Emergency Plan identifies two levels of plant emergencies:

Level One- Emergencies controlled by the on-site emergency response team.

Level Two- Any plant emergency that requires more resources than are available in the plant and/or environmental incident that would impact the surrounding area.

When upgraded to a level two incident, the furnace or kiln PROVOX Operator will be instructed to activate the plant emergency sirens, initiating plant headcount procedures.

The emergency sirens are tested every Friday at 12:00 noon.

HEADCOUNT:

When the sirens are activated, Mark III will report to the Mark III Shop for headcount.

On weekends, holidays and night shifts, Mark III personnel assigned to manufacturing areas should report to the designated manufacturing headcount area.

Temporary contractors/visitors are to report directly to the guard station used for entry into the plant (East ext. 1310 or West ext. 1480) for headcount reporting.

NorthWest Cleaning personnel assigned to work in remote areas of the plant (Furnace Office, E&I Shop, etc.) should immediately phone East Security to report headcount and receive further instructions.

If the contractor/visitor cannot report to the assigned guard station, proceed to the closest designated area (listed below) and report by phone or radio to your assigned area (the guard station). The CMR assigned to the contractor/visitor is responsible to inform them of emergency procedures and if possible escort them to the assigned headcount.

Plant Headcount Areas

- 1. #8 & 9 Furnace Tapping Lunchroom
- 2. #7 & 8 Furnace Operating Level Lunchroom
- 3. Phos Dock Lunchroom
- 4. Main Shop Lunchroom
- 5. Machine Shop Lunchroom
- 6. Electric Shop Lunchroom
- 7. HEG Lunchroom
- 8. Department 10 Lunchroom
- 9. Mark III Shop Lunchroom
- 10. Security Office (East Entrance)
- 11. Security Office (West Entrance
- 12. Admin. Building Multipurpose Room #59
- 13. Storeroom Conference Room

Evacution:

In the event the evacuation becomes necessary, the emergency plan indicates two levels of evacuation:

Partial Evacuation-Instructions will be delivered via radio, telephone or runner.

Full Site Evacuation-The emergency sirens will be activated a second and third time. Indicating the need for all personnel to proceed to the assigned evacuation collection areas as listed below:

Plant Evacuation Collection Areas

South Area: (As indicated by the assigned CMR)

Primary - Administration Building Multi-Purpose Conference Room. Secondary - HEG Shop

North Area: (as indicated by the assigned CMR)

Primary - HEG Shop Secondary - Administration Building Multi-Purpose Conference Room.

If you are outside of, or cannot safely reach your designated collection area, proceed to the assigned secondary collection area and report by phone or radio.

The CMR assigned to the contractor/visitor, if possible, should escort them to the assigned evacuation collection area.

EMERGENCY EQUIPMENT:

- 1. The use of designated fire equipment for activities other than fire fighting is prohibited.
- 2. Know the location of, and how to use, emergency equipment in the area where you are working. Emergency equipment includes safety tubs, showers, eye wash stations, stretchers, positive air equipment and fire extinguisher.
- 3. Any contractor performing work on a fire protection system must first obtain an Impairment Permit from the Safety Department. Fire protection systems include fire water supply systems, sprinkler systems, FM-200 systems, etc.
- 4. Never block emergency equipment such as fire hydrants, hoses, extinguishers, emergency vehicles etc.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them. Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11 DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.1.3 TRAINING

- Contractors shall instruct each employee in the recognition and avoidance of unsafe conditions and regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury.
- 2. Contractors shall maintain records of all employees training. Training records shall contain, as a minimum:
 - a.) Name and signature of the employee
 - b.) Date of training
 - c.) Subject and content of the training
 - d.) Means used to verify that employee understood the training
 - e.) Name of the instructor
- When requested, the Certified Monsanto Representative shall be provided with documentation and certification of contractor training. In addition, the contract company must assure that all employees have the appropriate job skills, knowledge and proper technical certifications necessary to perform their work safely. Some certifications may include but are not limited to: Certified Welders, Crane Operators, Qualified Electrical Workers and Qualified Riggers. Monsanto reserves the right to audit Contractor Safety Training.

6.1.3 Training

Monsanto Internal

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them. Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11 DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11 SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Guidelines

6.1.4 ENGLISH PROFICIENCY

1. All contractors must have the ability to read and speak English in order to perform their work safely.

6.1.4 English Proficiency

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.2.0 WORKING IN AN OPERATING UNIT

Department Hazards

- 1. No one shall enter another department to perform work or use that department's equipment without first obtaining permission from that department's Operating Crew Supervisor.
- 2. No unauthorized person should ever start up or shut down a piece of equipment in any department (unless danger to another person's life exists).
- 3. Owning department will be responsible for clearing/isolating all process lines as well as initiating any and all required hazardous work permits.
- 4. Never reach under or between belts, pulleys, idlers, rollers, chains, gears, etc., unless the equipment is locked out.
- 5. Equipment shall not be operated without proper guards and safety chains in place.
- 6. Only qualified members of the Monsanto Electrical Department will open electrical boxes to remove fuses, energize resets or to perform other electrical functions. Electrical contractors must first get clearance from the Monsanto Electrical Department to perform any electrical work. The use of Ground Fault Circuit Interrupters is required when using tools.
- 7. Due to the high potential of injury resulting from the uncontrollable whipping of an air hose, which has unexpectedly uncoupled, whip checks will be required when using tools such as jackhammers and air drills.
- 8. Whip checks are also required when doing any high pressure water blasting. There are two types of whip checks available from the plant Storeroom.

- 9. All snap-on hose connections must be secured by wire pins.
- 10. No one shall use compressed air to clean his or her clothing or body. Compressed air shall not be directed toward anyone.
- 11. Compressed air shall not be used for cleaning purposes except when reduced to less than 30 P.S.I., or when a venting device is used along with all appropriate personal protective safety equipment. Note: Use industrial vacuums whenever possible.
- 12. Department Supervisor's approval must be obtained before using steam or air to unstop a pipe or line.
- 13. When working with Soda Ash or Lime; goggles and dust mask or respirators with Hepa filters are required.
- 14. Any cam-lock fitting used on Soda Springs Sites must be secured with a secondary safety device such as wire ties, pins, etc., or other means to prevent inadvertent disconnection.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.2.1 OFFICE SAFETY

- 1. The following items, while not intended to be all-inclusive, are indications of some of the areas of concern for good office safety:
 - a. Never carry pencils with points exposed in shirt pockets.
 - b. Report spills, slipping and tripping hazards to the supervisor immediately. Clean up or correct them as soon as possible.
 - c. Keep all machinery guards in place.
 - d. Never leave paper cutter arm in an up, or open position.
- 2. The following items, while not intended to be all-inclusive, are indications of some of the areas of concern for good office housekeeping:
 - a. Do not store used equipment in office.
 - b. Do not stack large amounts of paper, and other items, on the tops of file cabinets, bookcases and tables.
 - c. Clear desk and table tops at the end of each workday.
 - d. Use coat racks or closets for coats and surplus clothing.
 - e. Limit wall hangings to what is appropriate.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.3.1 BASIC ENVIRONMENTAL SAFETY AND HEALTH RULES

Working safely is a condition of employment at this plant. Each employee (Monsanto & Contractor) must comply with the plant's safety rules and policies. Knowledge of these specific rules and policies is mandatory in order to perform work safely. In general, plant rules are provided to help insure everyone's safety. The following site-specific rules are provided to address specific safety concerns that are unique to our plant.

- 1. The best insurance against incidents and injuries:
 - a) Know the job, the pertinent safety rules and area hazard.
 - b) Keep focused, and your mind on the work at hand.
 - c) Use common sense.
 - d) If you can't do it safely, don't do it.
 - e) If you don't know, don't be afraid to ask.
- 2. Only approved hard hats (ANSI 289.1-1969), which are equipped with goggles, shall be worn inside the plant.
- 3. Long hair below the nape of the neck must be pinned up or worn in a ponytail.
- 4. Radios, televisions, and cameras require permission from the Site Manager before being brought into the plant. The use of a cell phone camera for taking pictures requires permission from the Site Manager.
- 5. All individuals have a direct responsibility to immediately report unsafe acts or conditions to supervision. This includes reporting any near misses including, but not limited to: unexpected equipment condition, defeated

- safety systems, or other process safety or personal safety items. If a potential injury is imminent, an attempt must be made to stop the unsafe act or condition, and report it through the use of the corrective action form.
- 6. It is the responsibility of the CMR to explain area hazards to the contractor before the contractor performs any work.
- 7. All "Hot" work will cease if the plant disaster alarm is sounded. (This includes cigarette smoking).
- 8. Eating or drinking is prohibited in production areas (designated eating areas are provided).
- 9. Contractors must observe safety signs while on Monsanto property.
- 10. Contractors performing work inside the main office, service building, laboratory or storeroom, will wear the appropriate safety protection (to be identified by the Safety Department).
- 11. Always use handrails when going up and down stairs. Remember the 3-point contact.
- 12. Objects or equipment must never be placed within 3 feet of electrical boxes or disconnects.
- 13. Equipment shall not be operated within 15 feet of power lines.
- 14. A full-face cutting hood or a face shield with goggles is required when using a cutting torch.
- 15. A face shield with goggles is required when doing any kind of grinding, cutting, sanding, water blasting, sawing, hammering or chipping that might have the potential for flying debris.
- 16. BUTANE lighters are not allowed in the plant.
- 17. No one under the age of eighteen may work on Monsanto property. This includes contractors and sub contractors.
- 18. Contractors should avoid strains when lifting by keeping their back as nearly upright as possible, using leg muscles instead of the back and stomach muscles. They should not attempt to lift more than 50 lbs per person without assistance.

PERSONAL CONDUCT:

Certain rules of personal conduct on the job are necessary for the successful operation of any organization. Some of the things that are prohibited while on Monsanto property are:

- 1. Smoking at Safety Meetings, in offices, or at any Monsanto function being conducted indoors.
- 2. Bringing intoxicating liquor or narcotics into the plant, or entering the plant under the influence of liquor or drugs, drinking or using narcotics on company property.
- 3. Bringing firearms or any type of explosive into the plant unless approved by the Site Manager.
- 4. Engaging in fights, horseplay, practical jokes or indecency.
- 5. Willfully damaging plant or personal property.
- 6. Using threatening or abusive language toward fellow employees or supervision.
- 7. Stealing.
- 8. Gambling on plant property.
- 9. Posting notices on company property without prior approval of Plant Management.

The above general rules cannot possibly cover all situations that might arise. As a rule of thumb however, it can be assumed that contractor/visitors are not to engage in any activity that interferes with another employee's or group of employees work, or engage in activity that interferes with the normal continuity of plant operations or the maintenance of order on its premises.

JEWELRY POLICY:

- 1. Rings, metal band watches, bracelets and necklaces will not be worn in the plant, quarry, storeroom, lab or mine.
- 2. Rings, metal band watches, bracelets and necklaces will not be worn when performing maintenance/electrical work on plant property.

- 3. Hoop: earrings, nose-rings and brow-rings will not be worn in the plant, mine quarry, storeroom or lab or when performing maintenance/electrical work on plant property.
- 4. Stud jewelry is allowed.
- 5. Medical alert necklaces and bracelets are allowed, and will be kept under clothing when performing maintenance.

CELL PHONE POLICY - such as talking, texting, and gaming is PROHIBITED:

- 1. When driving any motorized vehicle on Monsanto property.
- 2. When walking in "out of office" areas throughout plant and remote sites. (Take the call only when stopped in a safe area.)
- When working in an area where a hazardous work permit exits; however, in this circumstance, a cell phone may be used for business and/or emergencies only.
- 4. Employees, contractors and visitors are asked to use good judgment when using their cell phones in manufacturing areas of the Soda Springs plant. Do not allow a cell phone to distract or otherwise cause inattention while performing a task. Keep your mind on your work until you can safely answer a call.
- 5. The best time to use cell phones for personal business is break time.

BARRICADE TAPE POLICY:

All excavations, holes in floors, areas where work is being performed overhead or temporary work areas where tripping or falling hazards exist will be covered over, roped off, or barricaded off. It is important that the proper barricade tape in conjunction with the proper tag be used when barricading an area. The Soda Springs plant uses two types of barricade tape: yellow & black barricade tape and orange barricade tape.

All barricade tape must be tagged with either a DANGER tag or a CAUTION tag. The DANGER tag or the CAUTION tag must include a description of the hazard, be signed by the person establishing the barricade, be placed on the barricade tape and be spaced frequently enough for easy identification.

 Orange barricade tape is to be used to barricade an area, which has been determined to be hazardous for entry. Orange barricade tape is considered the same as a lockout. Once the orange barricade tape has been put up, NO ONE IS ALLOWED TO ENTER THAT AREA, not even the person who applied the barricade tape. A DANGER tag must be attached to the barricade tape as described in #3 of this section. CAUTION tags are NOT to be used with orange barricade tape. Once the hazard has been identified and all safety precautions are taken to correct the hazard, the orange barricade tape can be taken down and replaced with yellow & black barricade tape (if necessary) so that work can proceed.

- 2. Yellow & black barricade tape is used to identify an area where a hazardous condition may exist. Either CAUTION or DANGER tags, as described in #3, may be used with yellow & black barricade tape.
- 3. CAUTION tags are used, entry into the barricaded area may occur, after reading the warning on the CAUTION tag. If DANGER tags are used, entry into the barricaded area can only occur after requesting permission from the person who established the barricade. If work proceeds beyond shift change, the CAUTION or DANGER tags must be replaced and signed by the oncoming shift.
- 4. All barricade tape is to be promptly taken down when the reason for the barricade no longer exists. Barricade tape is to be placed in trash containers when it is removed. Barricade tape is NOT to be left lying on the ground in the work area.
- 5. All open holes in the floor must be surrounded by barricade tape.

PEDESTRIAN TRAFFIC:

- Pedestrians must use designated walkways and be aware of the beeping signal from backing equipment. They should also be aware of the limited visibility of heavy equipment operators.
- 2. Stay a safe distance from a moving piece of equipment until the attention of the operator has been gained.
- 3. Running up or down stairways or throughout the plant unnecessarily is not allowed.
- 4. Do not sit on handrails or lean on safety chains.
- 5. Never enter pot carrier area, nodule stockpile area, or the belt filter press cake/ore screen house area, without proper clearance.

RAILROAD SAFETY:

1. Cross railroad tracks only at regular crossings provided for that purpose. If railroad cars are blocking a road or passageway, do not climb over, between, or under them instead, walk around them.

- You should allow at least eight feet of clearance between you and the car.
 This rule is in effect at all times whether or not a switch is being made.
 Anyone violating this rule will be subject to disciplinary action.
- 3. No one shall place material, equipment or do work within 8 feet of the center line of any railroad track without first contacting the Material Handling Department and/or Phos Dock personnel to have the tracks Blue Flagged and Locked Out.

BLUE FLAG

- 1. Whenever anyone is working around a railroad car at the phos dock, railroad shop, coke bunker(s), or anywhere on the plant tracks, a Blue Flag must be in place on the southernmost car on the affected track.
- 2. Keep derail closed at all times except when switching railroad cars.
- 3. Chock the wheels on lead car on a downgrade.
- 4. Any person(s) working in a railroad car area shall use a Blue Flag sign. Ownership and clearing of plant railroad tracks will be as follows:

RR track ownership:

Heavy Equipment Group – Track 721, commonly known as track #1. Phos dock – Track 722, commonly known as phos loading track #2. Reliability group (Railroad Shop) – Track 723, 724, 728.

Note: Work by the (authorized) **owning track group** requires a Blue Flag only.

Note: Work by the (affected) **non-owning employees** requires the use of some type of control method in addition to the blue flag. For example, a tag lock and tag, or lockbox must be used by both the owning track group and non-owning employees. This will ensure that all involved groups are recognized and that communication is maintained.

- 5. In the event that work is to be performed on a track by a group other than the owner, contact must first be made with the track owner and lockout tag affixed to the blue flag.
- 6. Persons needing to work across or within eight feet of the phos loading track shall contact the phos dock Crew Supervisor or backup, and fulfill the following requirements.

- a. The phos dock will place a tripod Blue Flag sign at the south end of the phos loading track. The phos dock and persons performing the work on or near the tracks must lock out the car puller if there are any cars to the north of where the work is to be performed.
- b. Skates or chocks will be used on the first car on either side of the work area.
- c. Non-phos dock person(s) performing the work will affix a lockout tag bearing his/her name to the Blue Flag tripod sign. This is necessary to move rail cars before the work is completed. If a lockbox is being used then a tag must be affixed to the blue flag indicating that a lockbox is being used.
- d. Work should be completed as promptly as possible to minimize any impact on loading and switching activities. When work is complete and the tracks clear, notification should be made immediately to the phos dock. The lockout tag must be removed from the tripod sign and the car puller if locked should be unlocked.
- e. In the event that work extends beyond the end of the phos dock personnel's shift, a special written permit will be issued by the phos dock to authorize removal of the Blue Flag. This permit will contain a checklist for the person removing the Blue Flag who may not be familiar with the procedure to assure that the track is cleared.
- f. No one may remove a Blue Flag from the phosphorus-loading track other than the phos dock or the holder of a written permit.
- g. No one shall remove a Blue Flag bearing a lockout tag.

WORK-IN PROGRESS/ PERFORMANCE EVALUATIONS:

 Contractors must participate in work-in-progress audits when asked to by the Monsanto Representative.

WAPITI/ BEHAVIORAL BASED SAFETY PROCESS:

- Contractors will be asked to participate in the BBS Process.
- The BBS process identifies behaviors, which may lead to an injury or property damage.
- BBS is part of the safety culture and is an important part of changing an unsafe act.

HAZARDOUS ENTRY AND GENERAL ENTRY PROCEDURES:

A properly completed and approved hazardous work permit is required prior to performing hazardous jobs, entering vessels or entering designated confined spaces in the plant. The department Crew Supervisor may issue hazardous work permits or a responsible operator, provided the conditions of the hazardous work permit can be met. Otherwise, the job must stop until the permit can be properly completed and approved or a special written clearance is obtained.

- Hazardous work permits are only valid during the shift in which it was created. If the work proceeds past the end of the shift, a new hazardous work permit must be completed.
- 2. Hazardous work permits must remain at the job site until completed and then should be returned to the operating crew supervisor.
- Only Monsanto Employees are authorized to start/stop equipment or open/close valves. When these steps are needed, contact your assigned CMR.

NOTE: Nitrogen and inert gas are used to purge oxygen from most vessels in the plant. Inert gas sometimes contains hazardous amounts of Carbon Monoxide. Breathing pure nitrogen or inert gas can be fatal.

Permits:

There are many different permits in this plant that have been developed to assist in performing safe operations. It is the responsibility of each individual to know when and where a permit is required to perform a job. If in doubt about the need for or use of a permit, ask the CMR who represents you. Listed below are some of the permits that are used at this site. This list is not all-inclusive other permits maybe necessary and your assigned CMR will assist you in determining permits you need to complete your assigned work:

- 1. Hot Work Permit
- 2. Work Execution Permit
- 3. Confine Space Entry Permit
- 4. Line Entry Permit
- 5. Lifting Personnel with Crane Permit
- 6. Elevated Work Permit
- 7. Excavation Permit

The document user is responsible to ${\it MAKE}$ SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.3.5 INJURY AND ILLNESS RECORDKEEPING AND REPORTING

The Plant Dispensary is available for initial treatment of injuries, which occur on company property. The plant has a trained 24 Hour Emergency Response Team and EMT's for rescue work. Call 777 for emergency first aid support. Be sure to give your name, the location of the injured, and, if possible, the extent of the injury. Go or send someone to direct the emergency crew to the exact location of the injury.

- 1. Contractors/visitors are required to immediately report all injuries, no matter how small, to the CMR and Safety Department or on-shift EMT. A First Aid card (blue/Contractors) must be filled out immediately for any first aid or injury. Any transport to the hospital requires a blue first aid card to accompany the injured/ill employee. MD information is required on the back of the card. The first aid cards are located in the Administration Building Dispensary. The CAF (corrective action form) is attached and must also be submitted.
- 2. Contractors are required to submit a monthly Man-Hour & Illness/Injury Report to the Contractor Safety Specialist.
- 3. If you are personally exposed to blood/body fluids, immediately wash exposed area with soap/water, isolate the contaminated area, call EMT's to perform decontamination, and report exposure to the Safety Department.
- If blood/body fluids are discovered (without personal exposure), isolate the area from other personnel and call Plant EMT's to perform decontamination procedures.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.4.4 MONSANTO SECURITY POLICY

- Contractors and their employees normally will be governed by the terms of their particular contract. In all cases, contractor's personnel are confined to the area in which they are working.
- 2. Contractors and their employees will use the entrance and exit gate, which has been designated by Monsanto.
- 3. Service Representatives and Service Company employees who are not under a formal contractual arrangement will be registered in and out. The plant guards will administer the above policy and enforce the necessary rules required to carry it out.
- 4. Contractor parking facilities will be separate from Monsanto Employee parking.
- 5. An approved Material Pass will be required for contract employees and visitors when leaving company property with bundles, packages, boxes, materials, equipment, etc. Plant guards may periodically inspect packages, even though the individual may have a Material Pass. Lunch boxes do not require a pass, but must be opened for inspection upon request. Vehicles leaving the plant are also subject to inspection at any time.
- 6. Each contractor's employees and/or visitors will be required to identify him or herself when entering or leaving company property. This shall include signing the log in the guard station.
- 7. Only the Plant Manager or their delegate can authorize the use of cameras, camera equipment or cell phone cameras. They will not be permitted within the plant without this authorization. Any photographs or video taken of the facilities will need the same authorization.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.9.1 SUBSTANCE DETECTION

General Requirements:

In the general requirements for Low-Risk and High-Risk contractors, refer to 5.0 Contractor/Guest ES&H Guidelines, 5.9.1 Substance Detection.

This policy is in effect for all Monsanto Soda Springs locations including the Rock Springs, Wyoming Calciner facility, and all affiliated off-site mining operations and properties (hereinafter referred to as Soda Springs Facilities).

Contractors that do not have a substance abuse policy consistent with these guidelines will not be allowed in a Soda Springs facility without a Monsanto management exception.

All contractors have been classified into one of two categories, High-Risk or Low-Risk. This classification was determined as to the type of work that the contractor performs at Soda Springs Facilities.

Requirements for Both Low-Risk and High-Risk Contractors:

Low-Risk and High-Risk contractors must maintain a copy of an executed **Substance Abuse Policy Statement (Exhibit A)** for each contract employee who works at a Soda Springs Facility; and

Low-Risk and High-Risk contractors must present at the time of site orientation an executed **Substance Abuse Policy Statement (Exhibit A)** for each contract employee undergoing site orientation.

If the Certified Monsanto Representative (CMR) suspects any contract employee is impaired due to alcohol, drugs or other substances, that contract employee will be asked and required to immediately leave the Soda Springs Facility and not return until that contract employee has undergone a substance abuse test verifying that he or she is, in fact, substance free.

Additional Requirements for High-Risk Contractors:

A. Testing Program: All High-Risk contractors must implement one of the two following substance abuse testing programs, although please note that Monsanto prefers that its High-Risk contractors implement the first option:

Option One: Contractor must execute and provide to Monsanto the Contractor Employer Substance Abuse Verification (Exhibit B) and must implement a substance-abuse testing program that contains the following elements:

- Prior to Working at Soda Springs Facilities Contractor must have a program that documents that each contract employee working at a Soda Springs facility has passed a substance-abuse test prior to that individual starting work at any Soda Springs Facility.
- 2. Random Testing Contractor must have a documented program providing evidence that at least 35 percent of its work force who have worked at Soda Springs Facilities has been randomly tested during the prior year. The testing of the 35 percent must occur evenly over an annual time frame. Testing all personnel on a single day does not qualify as random.

Option Two: Contractor must execute and provide to Monsanto the Contractor Employer Substance Abuse Verification (Exhibit B). Within 15 days prior to any contract employee beginning work at the Soda Springs Facilities, and within six months of any previous test, Contractor must test that individual and maintain executed Contractor Employee Substance Abuse Verification(s) for that test(s). Contractor will provide to Monsanto a copy of the executed Contractor Employee Substance Abuse Verification (Exhibit C) at the time of that individual's site orientation. This testing requirement applies for as long as the contract employee continues to work at the Soda Springs Facilities. If there is a 45-day lapse in any assignment to the Soda Springs Facilities for any particular contract employee, contractor must test that individual within 15 days prior to him or her restarting work at the Soda Springs Facilities.

B. Test Requirements: The substance abuse testing conducted pursuant to the above guidelines must be for the following listed substances (or other such substances as indicated in writing by Monsanto) at levels set forth in the Federal Register of Health and Human Services Guidelines published in the Federal Register on April 11, 1988 [53 F.R. 11970], and any amends thereto.

Amphetamines
Cannabinoids (THC)
Cocaine Metabolite
Opiates
Phencyclidines

All tests shall be performed in a Substance Abuse and Mental Health Services Administration (SAMHSA) certified laboratory.

- C. Positive Results: If a contract employee tests positive for substance impairment or contractor suspects a contract employee of substance impairment, contractors shall:
 - 1. Immediately remove the contract employee from the Soda Springs Facilities.
 - 2. Inform the CMR Leader and Purchasing Lead.

A contract employee who has tested positive for substance impairment shall not be allowed to return to the Soda Springs Facilities until the CMR Leader or Purchasing Lead has been provided verification and documentation that the contract employee has successfully completed a recognized substance abuse rehabilitation program.

EXHIBIT A

SUBSTANCE ABUSE POLICY STATMENT

Employee Name:	
Contractor Name:	("Company")
In connection with your employment, you may be Company's client, Monsanto Company ("Monsanto	
The use, possession, sale and distribution of unauthorized substances, or the presence of Company's drug testing programs for such subsprohibited on any Monsanto work location, including among others, marijuana, hashish, heroin, crack/c	an individual testing positive under stances for non-medical reasons, are ng project sites. Illegal drugs include,
Entry to any Monsanto work location, including conditional on Monsanto's right to search the entroprohibited drugs and paraphernalia, alcoholic beverproperty or equipment. The Certified Monsanto Fremove any contract employee from any of the So abuse test can verify that the contract employee is	rant's personal effects and vehicle for erages, or possession of unauthorized Representative (CMR) has the right to da Springs Facilities until a substance
Violation of this policy or refusal to submit to a seimmediate termination of Permission/Authorization agree to abide by Monsanto's reasonable suspicion	n to work on Monsanto's premises. I
I HAVE READ AND UNDERSTAND THE ABOVE	POLICY.
Employee Signature	Date

EXHIBIT B

CONTRACTOR EMPLOYER SUBSTANCE ABUSE VERIFICATION

I hereby certify that our Company substance abuse program meets the standard set forth in the Monsanto Soda Springs site-specific document 6.9.1 as outlined in Option One or Two. I also agree to periodic audits of our substance abuse testing program to provide evidence that the program is in conformance.

Our selected option for the Soda Springs Site High Risk Contractor is:

Option One	_ Option Two
Name of Contract Company:	
Printed Name:	
Signature:	
Title:	
Date:	

Please fax or return the above information:

Monsanto Company
Attn: Matt Kirby
(208) 547-1253 Office
(208) 547-3763 FAX
sodasprings.contractor-guest@Monsanto.com

EXHIBIT C

CONTRACTOR EMPLOYEE SUBSTANCE ABUSE VERIFICATION

Name of Employee:	
ast four digits of Social Security Number:	
Date Sample Taken:	
Name of Testing Laboratory:	
Test Utilized:	
Negative Test Results* Yes No*Do Not Send Actual Test Results	
I HEREBY CERTIFY THE ABOVE TEST RESULTS TO BE CORRECT TO THE BEST OF MY KNOWLEDGE.	
Name of Contract Company:	_
Name of Contract Company:	
Printed Name:	

Please fax or return the above information:

Monsanto Company
Attn: Matt Kirby
(208) 547-1253 Office
(208) 547-3763 FAX
sodasprings.contractor-guest@Monsanto.com



APPENDIX D

MATERIAL SAFETY DATA SHEETS



Material Safety Data Sheet

Creation Date 29-Dec-2009 Revision Date 29-Dec-2009 Revision Number 1

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name Deionized Water

Cat No. 290-065, 23-290-065, 751-610, 23-751-610, 751-628, 23-751-628, 25065A

Synonyms No information available.

Recommended Use In vitro diagnostic

Company Emergency Telephone Number
Fisher Diagnostics Chemtrec US: (800) 424-9300
A Division of Fisher Scientific Company, LLC Chemtrec EU: (202) 483-7616

A Part of Thermo Fisher Scientific, Inc.

8365 Valley Pike

Middletown, VA 22645-1905

Tel: (800) 528-0494

2. HAZARDS IDENTIFICATION

Emergency Overview

The product contains no substances which at their given concentration are considered to be hazardous to health

Appearance Colorless Physical State Liquid Odor odorless

Target Organs None known.

Potential Health Effects

Acute Effects

Principle Routes of Exposure

Eyes No hazard from product as supplied.
Skin No hazard from product as supplied.

InhalationLow hazard for usual industrial or commercial handling.IngestionLow hazard for usual industrial or commercial handling.

Chronic Effects None known.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Haz/Non-haz

Component	CAS-No	Weight %
Water	7732-18-5	100.0

4. FIRST AID MEASURES

Eye Contact Flush eyes with water as a precaution. Get medical attention immediately if symptoms occur.

Skin ContactRinse with water. Get medical attention immediately if symptoms occur.InhalationMove to fresh air. Get medical attention immediately if symptoms occur.

Ingestion Do not induce vomiting. Get medical attention immediately if symptoms occur.

Notes to Physician Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flash Point Not applicable

MethodNo information available.Autoignition TemperatureNo information available.

Explosion Limits

Upper No data available
Lower No data available

Substance is nonflammable; use agent most appropriate to

extinguish surrounding fire..

Unsuitable Extinguishing Media No information available.

Hazardous Combustion Products No information available.

Sensitivity to mechanical impact
Sensitivity to static discharge
No information available.
No information available.

Specific Hazards Arising from the Chemical

None known.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear

NFPA Health 0 Flammability 0 Instability 0 Physical hazards N/A

6. ACCIDENTAL RELEASE MEASURES

Personal PrecautionsUse personal protective equipment.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Soak up with inert absorbent material. Keep in suitable and closed containers for disposal.

Up

7. HANDLING AND STORAGE

Handling Handle in accordance with good industrial hygiene and safety practice.Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location.

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limits

established by the region specific regulatory bodies.

NIOSH IDLH: Immediately Dangerous to Life or Health

Personal Protective Equipment

Eye/face ProtectionWear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's

eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN

149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits

are exceeded or if irritation or other symptoms are experienced

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State Liquid
Appearance Colorless
Odor

Odor odorless
Odor Threshold No inform

Odor Threshold
pHNo information available.Vapor Pressure5.5 - 7.5@ 25°CNo information available.

Vapor Density 0.694

Viscosity No information available.

Boiling Point/Range 100°C / 212°F Melting Point/Range 0°C / 32°F

Decomposition temperature °CNo information available.

Flash Point

Not applicable

Evaporation Rate

Not limit available:
Not applicable
> 1 (Butyl Acetate = 1.0)

Evaporation Rate > 1 (Butyl Acetate = 1.0)
Specific Gravity 1.00

Solubility
No information available.
No data available

Molecular Weight 20.14
Molecular Formula H2O

10. STABILITY AND REACTIVITY

Stability Stable under normal conditions.

Conditions to Avoid None known.

Incompatible Materials None known

Hazardous Decomposition Products None known

Hazardous Polymerization Hazardous polymerization does not occur

Hazardous Reactions . None under normal processing.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	90 mL/kg (Rat)	Not listed	Not listed

Irritation No information available.

Toxicologically Synergistic

Products

No information available.

Chronic Toxicity

Carcinogenicity There are no known carcinogenic chemicals in this product

SensitizationNo information available.Mutagenic EffectsNo information available.Reproductive EffectsNo information available.Developmental EffectsNo information available.TeratogenicityNo information available.

Other Adverse Effects See actual entry in RTECS for complete information.

Endocrine Disruptor Information No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Contains no substances known to be hazardous to the environment or that are not degradable in waste water treatment plants.

Persistence and Degradability

Bioaccumulation/ Accumulation

No information available

Mobility

No information available

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification

14. TRANSPORT INFORMATION

DOT Not regulated

TDG Not regulated

IATA Not regulated

IMDG/IMO Not regulated

15. REGULATORY INFORMATION

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	CHINA	KECL
Water	Х	Х	1	231-791- 2	-		X	ı	Х	X	KE- 35400 X

Legend:

- X Listed
- E Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
- F Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
- N Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
- P Indicates a commenced PMN substance
- R Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
- S Indicates a substance that is identified in a proposed or final Significant New Use Rule
- T Indicates a substance that is the subject of a Section 4 test rule under TSCA.
- XU Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
- Y1 Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
- Y2 Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard

Chronic Health Hazard

No
Fire Hazard

Sudden Release of Pressure Hazard

No
Reactive Hazard

No

Clean Water Act

Not applicable

Clean Air Act

Not applicable

OSHA

Not applicable

CERCLA

Not Applicable

California Proposition 65

This product does not contain any Proposition 65 chemicals.

State Right-to-Know

Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

Non-controlled

16. OTHER INFORMATION

Regulatory Affairs **Prepared By**

Thermo Fisher Scientific

Tel: (412) 490-8929

Creation Date 29-Dec-2009

Print Date 29-Dec-2009

"***", and red text indicates revision **Revision Summary**

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of MSDS

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW DANGER!

EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD



High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

(rev. Jan-04)

Amerada Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800)424-9300
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS Internet Website www.hess.com/about/environ.html

SYNONYMS:

Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

(rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

Revision Date: 01/08/04 Page 1 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES

Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

(rev. Dec-97)

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

<u>SKIN</u>

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

Revision Date: 01/08/04 Page 2 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades MSDS No. 9950

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT: -45 °F (-43°C)

AUTOIGNITION TEMPERATURE: highly variable; > 530 °F (>280 °C)

OSHA/NFPA FLAMMABILITY CLASS: 1A (flammable liquid)

LOWER EXPLOSIVE LIMIT (%): 1.4% UPPER EXPLOSIVE LIMIT (%): 7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

Revision Date: 01/08/04 Page 3 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04) EXPOSURE LIMITS

Component (CAS No.)				Exposure Limits
	Source	TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	_1	5	
n-Butane (106-97-8)	ACGIH	800		2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000		
	ACGIH	1000		A4
Ethyl benzene (100-41-4)	OSHA	100		
	ACGIH	100	125	A3

Revision Date: 01/08/04 Page 4 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades MSDS No. 9950

Component (CAS No.)				Exposure Limits
	Source	TWA (ppm)	STEL (ppm)	Note
n-Hexane (110-54-3)	OSHA	500		
	ACGIH	50		skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
, ,	ACGIH	50		A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25		
Xylene, mixed isomers (1330-20-7)	OSHA	100		
• ,	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9.	PHYSICAL and CHEMICAL PROPERTIES	(rev. Jan-04)
		•

<u>APPEARANCE</u>

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE: 85 to 437 °F (39 to 200 °C)

VAPOR PRESSURE: 6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)

VAPOR DENSITY (air = 1): AP 3 to 4

SPECIFIC GRAVITY (H₂O = 1): 0.70 – 0.78

EVAPORATION RATE: 10-11 (n-butyl acetate = 1)

PERCENT VOLATILES: 100 %

Revision Date: 01/08/04 Page 5 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades MSDS No. 9950

SOLUBILITY (H_2O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 $^{\circ}F$). Gasoline with 15%

MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg Acute Oral LD50 (rat): 18.75 ml/kg

Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. **DISPOSAL CONSIDERATIONS** (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

Revision Date: 01/08/04 Page 6 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades MSDS No. 9950

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME: Gasoline
DOT HAZARD CLASS and PACKING GROUP: 3, PG II
DOT IDENTIFICATION NUMBER: UN 1203

DOT SHIPPING LABEL: FLAMMABLE LIQUID



15. REGULATORY INFORMATION

(rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH CHRONIC HEALTH FIRE SUDDEN RELEASE OF PRESSURE REACTIVE

X X X -- -- --

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (a.h.i) pervlene (191-24-2)	2.55

Benzo (g,h,i) perylene (191-24-2) 2.55 Lead (7439-92-1) 0.079

Revision Date: 01/08/04 Page 7 of 8

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades MSDS No. 9950

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

OTHER INFORMATION (rev. Jan-04)

HEALTH: 1 Slight NFPA® HAZARD RATING

FIRE: Serious 3 REACTIVITY: 0 Minimal

1 * **HMIS® HAZARD RATING HEALTH:** Slight

> Serious FIRE: 3 REACTIVITY: Minimal

* CHRONIC

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

< = Less than AP = Approximately > = Greater than N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

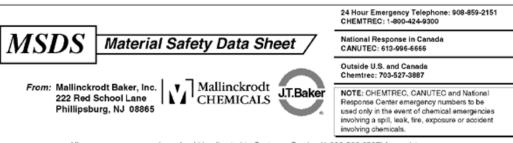
ACGIH American Conference of Governmental NTP National Toxicology Program	
Industrial Hygienists OPA Oil Pollution Act of 1990	
AIHA American Industrial Hygiene Association OSHA U.S. Occupational Safety & Health	
ANSI American National Standards Institute Administration	
(212)642-4900 PEL Permissible Exposure Limit (OSHA)
API American Petroleum Institute RCRA Resource Conservation and Recov	ery Act
(202)682-8000 REL Recommended Exposure Limit (NIC	OSH)
CERCLA Comprehensive Emergency Response, SARA Superfund Amendments and	
Compensation, and Liability Act Reauthorization Act of 1986 Title III	
DOT U.S. Department of Transportation SCBA Self-Contained Breathing Apparatu	S
[General Info: (800)467-4922] SPCC Spill Prevention, Control, and	
EPA U.S. Environmental Protection Agency Countermeasures	
HMIS Hazardous Materials Information System STEL Short-Term Exposure Limit (general	ılly 15
IARC International Agency For Research On minutes)	
Cancer TLV Threshold Limit Value (ACGIH)	
MSHA Mine Safety and Health Administration TSCA Toxic Substances Control Act	
NFPA National Fire Protection Association TWA Time Weighted Average (8 hr.)	
(617)770-3000 WEEL Workplace Environmental Exposure	Э
NIOSH National Institute of Occupational Safety Level (AIHA)	
and Health WHMIS Workplace Hazardous Materials	
NOIC Notice of Intended Change (proposed Information System (Canada)	
change to ACGIH TLV)	

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Revision Date: 01/08/04 Page 8 of 8 MSDS Number: N3660 * * * * * Effective Date: 02/15/08 * * * * * Supercedes: 05/06/05



All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%

CAS No.: 7697-37-2 Molecular Weight: 63.01 Chemical Formula: HNO3

Product Codes:

J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607,

9608, 9610, 9616, 9617, 9670

Mallinckrodt: 1409, 2704, 2705, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid Water	7697-37-2 7732-18-5	50 - 70% 30 - 50%	Yes No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE, MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA (tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison) Flammability Rating: 0 - None

Reactivity Rating: 3 - Severe (Oxidizer)

1 of 6 3/29/2008 2:00 PM

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:

Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion:

Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:

Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:

Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:

Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

2 of 6 3/29/2008 2:00 PM

Fire Extinguishing Media:

Water spray may be used to keep fire exposed containers cool. Do not get water inside container.

Special Information:

Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

- -OSHA Permissible Exposure Limit (PEL):
- 2 ppm (TWA), 4 ppm (STEL)
- -ACGIH Threshold Limit Value (TLV):
- 2 ppm (TWA); 4 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

3 of 6 3/29/2008 2:00 PM

9. Physical and Chemical Properties

Appearance:

Colorless to yellowish liquid.

Odor:

Suffocating, acrid.

Solubility:

Infinitely soluble.

Specific Gravity:

1.41

pH:

1.0 (0.1M solution)

% Volatiles by volume @ 21C (70F):

100 (as water and acid)

Boiling Point:

122C (252F)

Melting Point:

-42C (-44F)

Vapor Density (Air=1):

2-3

Vapor Pressure (mm Hg):

48 @ 20C (68F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:

When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Conditions to Avoid:

Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

\Cancer Lists\			
	NTP Carcinogen		
Ingredient	Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

4 of 6 3/29/2008 2:00 PM

Environmental Fate: No information found. **Environmental Toxicity:** No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID

Hazard Class: 8 UN/NA: UN2031 Packing Group: II

Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)

Hazard Class: 8 UN/NA: UN2031 Packing Group: II

Information reported for product/size: 6.5GL

15. Regulatory Information

Ingredient	·	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2) Water (7732-18-5)		Yes	Yes	Yes	Yes Yes
\Chemical Inventory Status - Part 2\					
Ingredient		Korea	a DSL	NDSL	Phil.
Nitric Acid (7697-37-2) Water (7732-18-5)		Yes Yes	Yes	No No	Yes
\Federal, State & International Regulations - Part 1\					
Nitric Acid (7697-37-2) Water (7732-18-5)		1000	Ye:		No
\Federal, State & International ReIngredient	CERCL	A	-RCRA	Т 3 8	SCA-
Nitric Acid (7697-37-2)	1000		No	 N	 lo

3/29/2008 2:00 PM 5 of 6

Water (7732-18-5) No No No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0 Other: Oxidizer

Label Hazard Warning:

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor or mist.

Use only with adequate ventilation.

Wash thoroughly after handling.

Keep from contact with clothing and other combustible materials.

Do not store near combustible materials.

Store in a tightly closed container.

Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Environmental Health & Safety Phone Number: (314) 654-1600 (U.S.A.)

6 of 6 3/29/2008 2:00 PM

ALCONOX MSDS

Section 1: MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.

30 Glenn St. Suite 309

White Plains, NY 10603.

Manufacturer emergency 800-255-3924.

phone number: 813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.

30 Glenn St. Suite 309

White Plains, NY 10603.

Supplier MSDS date: 2005/03/09 D.O.T. Classification: Not regulated.

Section 2: HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155- 30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497 -19 - 8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722 - 88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758 <i>-</i> 2 9 <i>-</i> 4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A: ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).

CAS# 497-19-8: LD50 4020 mg/kg - rat oral. CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3: PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.

White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure Not applicable.

(mmHg):

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).

9.5

Specific gravity @ 20 °C: (water = 1).

0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil Not available.

dist.:

VOC: None

Section 4: FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.

Water

Water fog.

Special procedures: Self-contained breathing apparatus required.

Firefighters should wear the usual protective gear.

Auto-ignition temperature: Not available.

Flash point (°C), None

method:

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Hazardous combustion Oxides of carbon (COx).

products: Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5: REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous Will not occur.

polymerization:

Incompatible Strong acids. substances: Strong oxidizers.

Hazardous

See hazardous combustion products.

decomposition products:

Section 6: HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation. Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.

May cause abdominal pain. May cause gastric distress.

Effects of chronic Contains an ingredient which may be corrosive.

exposure:

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species Not available for mixture, see the ingredients section. & route:

Exposure limit of

material: Not available for mixture, see the ingredients section.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available. Teratogenicity: Not available. Mutagenicity: Not available. Synergistic materials: Not available.

Medical conditions Not available.

aggravated by exposure:

First Aid

Skin contact: Remove contaminated clothing.

Wash thoroughly with soap and water. Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.

Flush eyes with clear, running water for 15 minutes while holding

eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.

Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.

Never give anything by mouth to an unconscious person. Do not induce vomiting, seek immediate medical attention.

Section 7: PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.

Recover uncontaminated material for re-use. Wear appropriate protective equipment.

Contaminated material should be swept or shoveled into

appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and Protect against physical damage.

equipment: Avoid breathing dust.

Wash thoroughly after handling. Keep out of reach of children.

Avoid contact with skin, eyes and clothing. Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.

Store away from strong acids or oxidizers. Store in a cool, dry and well ventilated area.

Section 8: CONTROL MEASURES

Precautionary Measures

Gloves/Type:



Neoprene or rubber gloves.

Respiratory/Type:



If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye/Type:



Safety glasses with side-shields.

Footwear/Type: Safety shoes per local regulations. **Clothing/Type:** As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity.

Emergency shower should be in close proximity.

Ventilation requirements:

Local exhaust at points of emission.



Section 1 - Chemical Product and Company Identification

MSDS Name:

Sulfuric Acid Solutions 0.03-93%, Sulfuric Acid Solutions 0.01N - 12N

Catalog Numbers:

Q00652, Q00752, Q00852, Q01652, Q02652, Q02752, Q03752, Q03852, Q04652, Q04752, Q04852, Q05652, Q05852, Q06652, Q07552, Q07652, Q07752, Q07852, Q08552, Q08652, Q08852, Q09552, Q09752, Q55652, Q57652

Synonyms:

Company Identification:

Qorpak

1195 Washington Pike Bridgeville, PA 15017

Company Phone Number:

(412) 257-3100

Emergency Phone Number:

(800) 424-9300

CHEMTREC Phone Number:

(800) 424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name:	Percent
7732-18-5	Water	balance
7664-93-9	Sulfuric acid	0.03-93

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: Colorless

Danger! Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract

burns.

Target Organs: None.

Potential Health Effects

Eye:

Causes severe eye burns. Eye contact can result in blindness; exposure to mist leads to watering, irritation.

Skin

Skin contact may result in severe burns, blistering, pain.



Ingestion:

May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Vomiting and diarrhea of dark blood may occur; asphyxia from throat swelling. Stomach and esophagus may become perforated.

Inhalation:

May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract. At 5mg/M3 concentrations, nose and throat irritation occurs, with headache, cough, increased respiratory rate, impairment of lung to ventilate.

Chronic:

Delayed symptoms include tight chest, fluid in lungs, cyanosis (blue color), hypotension, bronchitis or emphysema. tracheobronchitis, dental erosion/discoloration, pneumonia, gastrointestinal disturbances may occur. Skin irritation/dermatitis, conjunctivitis and lacrimation of the eye can occur.

Section 4 - First Aid Measures

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids until chemical is gone. Get medical aid at once.

Skin:

Get medical aid at once. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get medical aid at once. Give one ounce (30ml) of milk of magnesia. Give conscious victim large quantities of water to dilute acid.

Inhalation

Get medical aid at once. Move victim to fresh air immediately. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Contact with metals may evolve flammable hydrogen gas. Avoid breathing toxic and corrosive vapors - keep upwind.

Extinguishing Media:

Use extinguishing media most appropriate for the surrounding fire.

Autoignition Temperature:

No information found.

Flash Point:

No information found.

NFPA Rating:

CAS# 7732-18-5: Not published.

CAS# 7664-93-9: health - 3; flammability - 0; reactivity - 2.

Explosion Limits:

Lower: Upper:



Material Safety Data Sheet

Sulfuric Acid Solutions 0.03-93%, Sulfuric Acid Solutions 0.01N - 12N

Section 6 - Accidental Release Measures

General Information:

Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

May be neutralized with slaked lime, limestone, or sodium bicarbonate to a pH 7. Place in labeled plastic containers for disposal, wash area down with water.

Section 7 - Handling and Storage

Handling:

Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use with adequate ventilation.

Storage:

Do not store near alkaline substances. Store in labeled non-reactive containers (glass, plastic) protected from heat and incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name:	ACGIH	NIOSH	OSHA
Water	None of the components are on this list.	None of the components are on this list.	None of the components are on this list.
Sulfuric acid	1 mg/m3 TWA;3 mg/m3 STEL	1 mg/m3 TWA	1 mg/m3 TWA;

OSHA Vacated PELs

Sulfuric acid: 1 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133. Provide an eye-wash fountain in the immediate work area. Do not wear contact lenses when working with chemicals.

Skin

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear acid protective clothing and gloves.

Respirators:

50mg/M3 -GMAGHiEP/HiEPF/SAF/SCBAF.

100mg/M3 - SAF:PD,PP,CF.

Escape - GMAGHiEP/SCBA. Firefighting - SCBAF:PD,PP.

(Respirator Codes: (NIOSH) PUblication No. 78-210)



Section 9 - Physical and Chemical Properties

Physical State: Liquid

Color: Colorless
Odor: Odorless
pH: Acidic

Vapor Pressure: No information found.Vapor Density: No information found.

Evaporation Rate: <ether

Viscosity: No information found.

Boiling Point: No information found.

Freezing/Melting Point: No information found.

Decomposition Temperature: No information found.

Solubility in water: Soluble. **Specific Gravity/Density:** 1.0 - 1.7

Molecular Formula: No information found.

Molecular Weight No information found.

Section 10 - Stability and Reactivity

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, excess heat, combustible materials, organic materials, oxidizers, amines, bases.

Incompatibilities with Other Materials

Explosive or violent reactions with acetone cyanohydrin, acetone and nitric acid or potassium dichromate, acrylonitrile, alcohols, hydrogen peroxide, allyl chloride, bromates and metals, bromine pentafluoride, carbides, all chlorates, chlorine trifluoride, cuprous nitride, ethylene cyanohydrin, fulminates, indane and nitric acid, iron, mercuric nitride, nitric acid and glycerides, p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, phosphorus isocyanate picrates, sliver permanganate, sodium, sodium carbonate, toluene and nitric acid. Dangerous temperatures and pressures occur with other substances, especially organic combinations. Explosive hydrogen gas is evolved from contact with steel, other metals.

Hazardous Decomposition Products

Oxides of sulfur, hydrogen gas.

Hazardous Polymerization

Has not been reported.

Section 11 - Toxicological Information

RTECS:

CAS# 7732-18-5: ZC0110000. CAS# 7664-93-9: WS5600000.



LD50/LC50:

CAS# 7732-18-5:

Oral, rat: LD50 = 90 mL/kg.

CAS# 7664-93-9:

Inhalation, mouse: LC50 =320 mg/m3/2H Inhalation, rat: LC50 =510 mg/m3/2H Oral, rat: LD50 = 2140 mg/kg.

Carcinogenicity:

CAS# 7732-18-5: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65.

CAS# 7664-93-9

ACGIH: A2 - Suspected Human Carcinogen (contained in strong inorganic acid mists)

California: Not listed. NIOSH: Not listed. NTP: Not listed.

OSHA: Select carcinogen IARC: Group 1 carcinogen

Epidemiology: Teratogenicity: Reproductive:

Mutagenicity:

Neurotoxicity:

Section 12 - Ecological Information

No information found.

Section 13 - Disposal Considerations

Dispose of in accordance with Federal, State, and local regulations.

Section 14 - Transport Information

US DOT

> 51% W/W 0.5%

0.5% to 51% W/W Sulfuric Acid < 0.5% W/W

Shipping Name: Sulfuric acid

UN Number: UN1830

Sulfuric A

Not regulated.

Hazard Class: 8

UN2796

Packing Group: PG II

PG II

Section 15 - Regulatory Information

US Federal

TSCA

CAS# 7732-18-5 is listed on the TSCA Inventory. CAS# 7664-93-9 is listed on the TSCA Inventory.



SARA Reportable Quantities (RQ)

CAS# 7664-93-9: final RQ = 1000 pounds (454 kg)

CERCLA/SARA Section 313

This material contains Sulfuric acid (CAS# 7664-93-9, 0.03-93%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

OSHA - Highly Hazardous

None of the components are on this list.

US State

State Right to Know

Sulfuric acid can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California Regulations

European/International Regulations

Canadian DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7664-93-9 is listed on Canada's DSL List.

Canada Ingredient Disclosure List

CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List. CAS# 7664-93-9 is listed on Canada's Ingredient Disclosure List.

Section 16 - Other Information

MSDS Creation Date: November 9, 1997

Revision Date: March 21, 2007

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and Qorpak assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.



A Newell Rubbermaid Company

MATERIAL SAFETY DATA SHEET

MSDS#

38400

Section One:

Identification

Sanford, L.P. 2707 Butterfield Road Oak Brook, IL 60523 USA 800-323-0749 or 630-481-2000 **EMERGENCY MEDICAL NUMBER:**

888-786-0972

Product Name:

Sharpie Mini

Colors:

All Colors

Sanford is a member of The Art and Creative Materials Institute, Inc. This product is certified by the Institute to be labeled in accordance with the voluntary chronic hazard labeling standard ASTM D-4236 and is labeled with the AP Non Toxic Seal. Products bearing the AP Approved Product Seal of The Art and Creative Materials Institute, Inc. are certified in a program of toxicological evaluation by a medical expert, subject to review by the Institute Toxicology Advisory Board, to contain no materials in sufficient quantities to be toxic or injurious to humans, or to cause acute toxicity or chronic health problems.

Section Two:

Hazard Identification

This product is considered safe under normal use conditions.

Section Three:

Composition

Dyes, n-propanol (71-23-8), n-butanol (71-36-3), diacetone alcohol (123-42-2)

Section Four:

First Aid Measures

Inhalation:

This product is considered safe under normal use conditions.

Skin Contact:

This product is considered safe under normal use conditions.

Eye Contact:

This product is considered safe under normal use conditions.

This product is considered safe under normal use conditions.

Ingestion:
Section Five:

Fire Fighting Measures

Flash Point:

84F Tag Open Cup (ASTM D-1310)

Flammability Limits (% by volume):

Lower: Not determined

Upper: Not determined

Extinguishing Media: As appropriate for surrounding area

appropriate for surrounding

Special Fire Fighting Measures:

None

Unusual Fire and Explosion Hazards:

None

Section Six:

Accidental Release Measures

In Case of Spill or Accidental Release:

Wipe up with absorbent material

Section Seven:

Handling and Storage

Handling:

Do not shake marker.

Storage:

Keep cap on marker when not in use.

Section Eight:

Exposure Controls and Personal Protection

Eye Protection:

None under normal use conditions.

Clothing: Respirator: None under normal use conditions.

None under normal use conditions.

Ventilation:

None under normal use conditions.



MATERIAL SAFETY DATA SHEET

MSDS#

38400

Physical and Chemical Properties Section Nine:

For ink unless otherwise specified:

Boiling Point:

207F (n-propanol)

Specific Gravity:

0.80 (n-propanol)

Vapor Pressure:

Not determined

Solubility in Water:

Miscible

Evaporation Rate:

Not determined

Appearance/Odor:

Colored liquid; alcohol odor

Section Ten: Stability and Reactivity

Stability:

Stable

Conditions to Avoid:

None known

Chemical Incompatibility:

None known

Hazardous Decomposition: Hazardous Polymerization: None known

Will not occur

Section Eleven: Toxicological Information

See Section Two: Hazard Identification for any hazards

Section Twelve:

Ecological Information

Not available

Section Thirteen:

Disposal Considerations

Dispose in accordance with Federal, State, and Local Regulations.

Section Fourteen:

Transport Information

DOT:

Not regulated

IATA:

Not regulated

IMO:

Not regulated

Section Fifteen:

Regulatory Information

TSCA:

The product listed on this Material Safety Data Sheet is not listed on the Toxic Substances Control Act Inventory. All ingredients used to manufacture this product are listed on the TSCA Inventory

Section Sixteen:

Other Information

HMIS Code

Health

N/A

Flammability

N/A

Reactivity

N/A

Personal Protection

N/A

Sanford has been advised by Counsel that the OSHA Hazard Communication Standard does not apply to the Sanford Product described in this Material Safety Data Sheet. The reason for the exemption is contained in 29 CFR 1910.1200(b)(6)(ix) as amended July 1, 2006 per the Code of Federal Regulations. The information contained in this MSDS is forwarded to you for your information, but is not meant to imply that the product is covered by the Hazard Communication Standard nor is this MSDS meant to comply with all requirements of the Hazard Communication Standard.

0=Minimal / 4 = Severe

APPENDIX B MONSANTO HEALTH AND SAFETY PROCEDURES



5.0.0 About This Document

5.0.1 Purpose

1. The purpose of this document is to convey Monsanto's corporate ES&H Guidelines to vendors, guests, contractors and persons carrying out activities on Monsanto property.

5.0.1 Introduction

1. The safety of all people working at Monsanto facilities is our top priority. The vision and goal of Monsanto is to create an incident and injury free workplace. This incident and injury free workplace cannot be attained without the same vision and commitment from each and every contractor and person working at our facilities. The Monsanto Contractor and Guest Environmental Safety and Health Guidelines provide a framework from which to work toward this goal. These guidelines must be strictly adhered to. Our safety philosophy and goals are intended to promote a team approach, foster a proactive attitude and work having a common goal, an incident and injury free workplace.

5.0.2 OSHA Standards, ANSI and Other References

1. A variety of Standards are referenced throughout this document. Although it is our intention to maintain this document as "evergreen" it must be noted that it is the responsibility of the contractor or person/s using this document to follow stated standards in their most current release, form or version.

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 0



5.1.0 Contractor Management System

5.1.0.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1926 Subpart C General Safety & Health Provisions

5.1.0.1 Monsanto General Requirements

- 1. Contractors shall provide, when specified by the Certified Monsanto Representative (CMR), the services of a full-time safety representative.
- 2. Contractors' safety representatives shall:
 - a. As a minimum, be certified as having taken the 30-Hour OSHA Construction Standards Course, or equivalent.
 - b. Manage the contractor's project safety program and will interface directly with the CMR.
 - c. Report directly to the contractor's corporate safety manager.
 - d. Have the authority to correct any hazard or unsafe practice on the project, even if a work stoppage is required.
- 3. The selection of a contractor's safety representative shall be approved by the CMR. Contractors shall provide to the CMR verification that the selected individual meets all the requirements set forth by Management.
- 4. Contractors shall have available at the job location employees who are qualified as competent persons. Contractors shall provide documentation demonstrating those employees' qualifications to perform as a competent person to the CMR.

5.1.0.2 Definitions

1. Competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Site Requirement *6.1.0

12/01/09 Revision Date: Next Revision Date: 12/01/11

Revision:



5.1.1 Emergency Response

5.1.1.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1910 Subpart L Fire Protection
 - b. 29 CFR 1926 Subpart C General Safety and Health Provisions

5.1.1.1 Monsanto General Requirements

- 1. Contractors shall comply with all location emergency response procedures, severe weather and evacuation plans.
- 2. All employees shall be trained in emergency procedures at the time employees receive their initial orientation. Contractors shall make all employees aware of the location alarm system code signals, public address announcement system, appropriate responses and how to engage the emergency response system at the location. Physician, hospital, ambulance and location emergency telephone numbers shall be conspicuously posted at the work site.
- 3. Contractors shall establish an evacuation and severe weather plan for the project location. Contractors' evacuation plans shall be coordinated with the location evacuation plan. A site plan showing evacuation routes and shelter locations shall be conspicuously posted at the work site.
- 4. In the event of an emergency, dial the location emergency number (or use other means as specified by the location) and give the responder the following information:
 - a. Name of person calling
 - b. Telephone number
 - c. Location of the emergency
 - d. Nature of the emergency

NOTE: Do not hang up. Maintain open communication until instructed otherwise.

5. Contractors shall provide emergency response equipment, such as fire extinguishers, personal protective equipment, etc., as necessary for the work site and the work being performed.

5.1.1.2 Definitions

1. Emergency: May include spills and releases, fire, explosion, bomb threat, severe weather conditions, and major injury or illness.

Site Requirement *6.1.1

Revision Date: 12/01/09

Next Revision Date: 12/01/11
Revision: 2



5.1.3 Training

5.1.3.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1926 Subpart C General Safety and Health Provisions

5.1.3.1 Monsanto General Requirements

- 1. Contractors shall train their employees in accordance with any specific additional training requirements noted in each of the individual Section 5 documents.
- 2. Contractors shall maintain records of all employees' safety training.
- 3. Employee safety training records shall contain:
 - a. Name and signature of the employee
 - b. Date of training
 - c. Subject and content of the training
 - d. Means used to verify that employee understood the training
 - e. Name of the instructor
- 4. Monsanto reserves the right to require the contractor to submit copies of employee safety training records as a pre-condition to permitting the employee(s) to perform work on Monsanto property. Alternatively, Monsanto may require contractor employees satisfactorily demonstrate knowledge and understanding of the training required in 5.1.3.0 through administration of a simple written questionnaire or test as a pre-condition to permitting the employee(s) to perform work on Monsanto property.
- 5. Contractors shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury

6. The above requirements pertain to any subcontractors engaged by the (prime) contractor. It will be the (prime) contractor's responsibility to insure that all subcontractors they engage comply with these requirements.

Site Requirement *6.1.3

Revision Date: 12/01/09
Next Revision Date: 12/01/11
Revision: 3



5.1.4 English Proficiency

5.1.4.0 Monsanto General Requirements

- 1. The environmental, safety and health process shall be administered in English consistent with the Contractor/Guest Environmental, Safety and Health Policy. Orientation, training, comprehension evaluation, application of environmental, safety and health procedures, such as: work permit procedures, job planning and any other processes or procedures related to working safely are included.
- 2. Contractor companies will be expected to staff the work to be done with personnel that can meet this requirement.
- 3. If the English deficiency is caused by a physical or mental disability, ADA rules will apply.

5.1.4.1 Application of Requirements to Specific Job Situations

- 1. Communication in English is required only when and to the extent necessary to conduct the assigned work safely.
- 2. Non-safety related activity, such as lunch breaks, are not covered by the requirement.
- 3. Communication on-the-job in another language is allowed if, for example, all persons directly involved in the work at the time communicate more effectively in that language.
- 4. The term communication covers the English language skills necessary for the person to receive and understand information, and to deliver information as required by the safety process.
- 5. Accent and grammar are not a consideration unless these preclude effective communication with others.

5.1.4.2 Exceptions to the Requirement

1. Exceptions to this requirement may be granted under certain conditions. When the pool of English speaking workers becomes unable to fulfill resource requirements. The Certified Monsanto Representative (CMR) must submit a written request for an exception. The exception must include reasonable accommodations that will allow for the safety of all Monsanto employees and other contractor employees affected by the use of non-English speaking workers. Both the CMR Leader and Site Manager must approve, by signature, the written exception.

Site Requirement *6.1.4

Revision Date: 12/01/09 **Next Revision Date: 12/01/11**Revision: 3



5.2.0 Working In Our Units and Facilities

5.2.0.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1910 Subpart H Hazardous Material

5.2.0.1 Monsanto General Requirements

- 1. Contractors shall not access, or perform any work on, operating process or equipment in our units or facilities unless specifically directed by the Certified Monsanto Representative (CMR).
- 2. When construction work is performed in an operating unit or facility:
 - a. Employees shall sign in at the control room when entering the unit, or as specified by the location.
 - b. Construction work shall be coordinated with operating unit supervision or site management.

5.2.0.2 Training Requirements

- 1. Contractor employees who perform process and manufacturing operations work shall be trained in the operation and maintenance of miscellaneous machines and equipment they will work with prior to starting work.
 - a. When contractors are not able to train their employees in the operation or maintenance of miscellaneous machines and equipment, the CMR or Competent Person shall perform the required training.

2. Contractor employees who perform process and manufacturing operations work shall be certified in accordance with location operator certification requirements for the specific work performed.

Site Requirement *6.2.0

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.2.1 Office Safety

5.2.1.0 Monsanto General Requirements

- 1. Areas occupied to perform clerical or office type duties shall be purposefully established for the use.
 - a. Desks, chairs, file cabinets and tables shall be manufactured for the use.
 - b. Work areas shall be designed for proper ergonomics of the individuals assigned to the area.
 - c. Work areas shall be equipped with glare free lighting of the proper intensity for the work activity being performed.
- 2. The following items, while not intended to be all inclusive, are indications of some of the areas of concern for good office safety:
 - a. Never leave unattended file cabinet or desk drawers open.
 - b. Do not open more than one file cabinet drawer at a time.
 - c. When moving office equipment, use proper lifting techniques and solicit help when the item is too heavy for one person to carry.
 - d. Do not lay electrical cords across aisles or walkways.
 - e. Do not use extension cords or adapter plugs to provide additional electrical outlets. Wire new outlets permanently.
 - f. Replace or repair all frayed electrical cords and defective electrical equipment.
 - g. Do not climb or stand on furniture.
 - h. Do not attempt to repair office machinery unless specifically trained to make the repairs.
 - i. Disconnect the power supply to office machines when making adjustments or reloading the magazine.
 - j. Keep work surfaces free of unnecessary clutter.
 - k. Do not overload desks, shelves or file cabinets.

5.2.1.1 Training Requirements

- 1. Employees shall be trained in the use and simple maintenance of office machines they will use prior to starting work.
- 2. Employees who will perform repairs to office machines and equipment shall be properly trained for the specific machines to be repaired.

Site Requirement *6.2.1

Revision Date: 12/01/09
Next Revision Date: 12/01/11
Revision: 3



5.3.1 Basic Environmental, Safety and Health Rules

5.3.1.0 Governmental Requirements

- 1. Contractors shall comply with all federal, state, county, and municipal or local safety laws bearing on their work.
- 2. Contractors shall comply fully with all applicable requirements of the Contract Work Hours and Safety Standards Act and the Occupational Safety and Health Act and the rules and regulations promulgated thereunder. Contractor's attention is specifically directed to 29 CFR, Chapter XVII, Part 1926, "Safety and Health Regulations for Construction", and Part 1910, "General Industry Safety and Health Regulations".

5.3.1.1 Monsanto General Requirements

1. Contractor employees shall be responsible for their actions and the impact their actions have on others. Safety shall be a condition of employment. Rules shall be reviewed in Pre-Bid meetings and the Site Orientation with all contractor personnel prior to work.

Site Requirement *6.3.1

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.3.5 Injury and Illness Recordkeeping and Reporting

5.3.5.0 Governmental Requirements

- 1. Contractors shall comply with the requirements of the following:
 - a. 29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses

5.3.5.1 Injury and Illness Recordkeeping

- 1. Contractors shall have responsibility for maintaining injury and illness records for their employees.
- 2. Monsanto will maintain a summary of OSHA Recordable Incident Information for contractors/guests.

5.3.5.2 Injury and Illness Reporting

- 1. Contractors shall immediately notify the Certified Monsanto Representative (CMR) of any occupational injury, illness, loss of or damage to management property, or spill and release, including all subcontractors and material suppliers under contractor control.
- 2. Contractors shall provide the CMR with a copy of the Employer's First Report of Injury or Illness (or such other similar report required by federal, state, county and municipal or local safety laws) for each job-related injury or illness to an employee. This report must be provided as soon as possible after the occurrence of an incident and according to location requirements.

5.3.5.3 Incident Analysis

- 1. The analysis process for potentially serious incidents, injuries, and illnesses shall be conducted as specified by the CMR. Procedures to be followed should include:
 - a. The first concern at an incident is care of the injured. Nothing should interfere with this except the safety of the rescuers themselves.
 - b. After the site is safe to approach, the analysis should begin.
 - c. Preserve the scene by protecting or barricading the area to prevent disturbance of evidence.
 - d. Conduct a walk-through of the incident site. Take notice of and record the location of all items of evidence. Mark the location of items likely to be moved.
 - e. Obtain the identity of all people who might have information about the incident. Record their names, crafts and company worked for.
 - f. Examine the evidence. Items that will provide information about what happened, how it happened and why it happened must be identified and examined. Photographs of the accident site and the items of evidence should be taken as soon as possible after the incident.
 - g. Make a diagram of the incident site. A sketch should be made showing the location of all evidence essential to understanding the incident situation. Distances should be measured and recorded on the sketch.
 - h. Interview all witnesses and obtain statements from them. Persons who may be able to contribute information about the incident should be interviewed as soon as possible after the incident, and recorded statements should be obtained from them.
 - i. A written report shall be prepared for all serious incidents. The report should include:
 - Incident description what happened, when it happened and who was involved
 - The root causes
 - Management and/or program deficiencies
 - Identification and implementation of corrective action to prevent a recurrence
 - Definition of accountabilities and timetables for corrective action
 - A designee to follow-up the corrective actions
- Incident and job-related injury data are maintained and periodically reviewed
 to determine the most serious and frequent causes. Appropriate actions to
 address the causes are implemented.

- 3. Immediately upon completion of a formal analysis report, copies shall be issued to those people designated by the CMR.
- 4. Contractors and the CMR shall maintain copies of all incident reports on file.

 $\begin{array}{lll} \text{Site Requirement} & *6.3.5 \\ \text{Revision Date:} & 12/01/09 \\ \textbf{Next Revision Date:} & \textbf{12/01/11} \\ \text{Revision:} & 4 \\ \end{array}$



5.4.4 Security

5.4.4.0 Monsanto General Requirements

- Monsanto Tier One facilities, as classified by Monsanto's Security Vulnerability Assessment (SVA), shall require the contractor to perform a background check on all employees and sub-contractor employees. Background checks will be conducted at the discretion of each site that is not classified as Tier One by the SVA.
- 2. The American Chemistry Council Guidance on Conducting Background Checks is the guidance document used by Monsanto to develop each site's background check requirements.
- 3. Contractor employees shall enter and leave the location only through the entrance specified by the Certified Monsanto Representative (CMR).
- 4. All persons visiting the location shall be registered at their entry and exit points in accordance with location requirements.
- 5. Contractor employees shall wear location-required identification (badge, pocket insert, sticker) at all times when on the location.
- 6. Cameras may be brought into and used only in compliance with the location requirements.
- 7. Routes for contractor employees through the location to the work site will be designated by the CMR. Contractor employees should remain in the particular area in which they are working.
- 8. Contractors shall comply with specific location conditions or additional security regulations.
- 9. Firearms of any type shall not be permitted except under special authorization from the CMR.

10. Contractors shall be responsible for the security of all materials, tools and equipment, whether owned by the contractor, rented by the contractor or loaned to the contractor by the CMR.

Site Requirement *6.4.4

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 3



5.9.0 Occupational Medicine

5.9.0.0 Governmental Requirements

- 1. Contractor shall comply with the requirements of the following:
 - a. 29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses (1904.0 1904.46)
 - b. 29 CFR 1926 Subpart D Occupational Health and Environmental Controls
 - c. 29 CFR 1910 Subpart K Medical and First Aid
 - d. Where applicable and depending on Job Scope and Requirements:
 - 29 CFR 1910 Subpart I Personal Protective Equipment (1910.134 Respiratory protection)
 - 29 CFR 1910 Subpart G Occupational Health and Environment Control (1910.95 Occupational noise exposure)
 - 29 CFR 1910 Subpart H Hazardous Materials (1910.120
 Hazardous waste operations and emergency response)
 - 29 CFR 1910 Subpart Z Toxic and Hazardous Substances
 - 29 CFR 1910.1001 Asbestos
 - 29 CFR 1910.1025 Lead
 - 29 CFR 1910.1030 Bloodborne pathogens
 - 29 CFR 1910.1048 Formaldehyde
 - 29 CFR 1926 Subpart D Occupational Health and Environmental Controls (1926.62 – Lead and 1926.65 – Hazardous waste operations and emergency response)
 - 29 CFR 1926 Subpart Z Toxic and Hazardous Substances
 - 29 CFR 1926.1101 Asbestos
 - 29 CFR 1926.1148 Formaldehyde
 - e. Contractors shall provide employee access to his or her personal medical records in accordance with the provisions of the following:

 29 CFR 1910 Subpart Z – Toxic and Hazardous Substances, 1910.1020 Access to employee exposure and medical records.

5.9.0.1 Monsanto Requirements

- 1. As applicable and per elements in this section, the Contractor shall comply with the requirements of the following from Monsanto Fundamental Requirements in Occupational Medicine (excerpts from these documents are included herein):
 - a. R35 Qualifications and Responsibilities of the OM Professionals Supporting Company Sites
 - b. R40 Pre-placement/Transfer Health Assessments
 - c. R42 Medical Leaves and Return to Work Assessments
 - d. R43 Exit Health Assessments
 - e. R45 Medical Surveillance for Hearing Conservation
 - f. R46 Respirator Medical Surveillance
 - g. R52- Bloodborne Pathogen Employee Protection

5.9.0.2 Monsanto General Requirements

- 1. Contractors shall provide for medical services that can evaluate and maintain the health of their employees in accordance with applicable governmental requirements.
- 2. Equipment shall be provided within the work area for quick drenching or flushing of the eyes and body for immediate emergency use if accidental exposure to corrosive materials occurs.
- 3. Contractors shall provide the Monsanto Representative with a copy of written procedures describing the content and delivery of medical services to their employees, including:
 - a. The name of the provider of the services
 - b. The professional qualifications and licensure status of the provider and staff
 - c. Medical surveillance required by governmental regulations and standards and as required by Monsanto.
- 4. Contractors shall provide applicable health and safety examinations for employees.
- 5. Contractors shall monitor their employee's exposure to chemical agents and physical stresses to ensure compliance with governmental medical

- surveillance requirements. When Monsanto chemicals or agents are involved in contractors' work, the Monsanto Representative will provide notice to the contractor for their compliance with medical surveillance requirements.
- 6. Contractors shall medically evaluate employees on return to work after an occupational injury or illness that occurred at a location. A physician's written opinion shall be obtained on the ability of the person to safely resume his or her designated duties.
- 7. The contractor is responsible for planning emergency response and transport for their employees. Monsanto employees at the location will assist with contractor emergency care only to the extent and level of proficiency acquired through certified training.
- 8. By prior arrangement with contractors, location management may authorize location medical personnel to provide non-emergency medical treatment to contractor employees to enable such employees to remain at work without interruption and time loss. All occupational injuries and illnesses dealt with in this manner shall be recorded by contractors in their medical logs.
- 9. When the contractor is a self-employed person (individual consultant), or is an employee of an employment agency who is assigned to duties on the location without supervision (for example clerks, temporary secretaries and laboratory technicians), the location will provide first aid or emergency medical treatment for all occupational injuries and illness.
- 10. If an individual is assigned to duties which require mandatory medical clearance (for example use of hearing protection, respirators, etc.) the contractor company or self-employed contractor is responsible for obtaining such examinations, and must advise location management of any restrictions which apply.

5.9.0.3 Medical Surveillance Programs

1. The listing below includes chemical/physical agents and situations for which occupational health surveillance is presently required. This listing could be changed periodically as appropriate by the Monsanto Department of Medical and Health Sciences (DMHS). This surveillance may be required by regulation and therefore legally mandated. In addition, there are exposures for which no legally enacted standard mandates surveillance, but for which Monsanto requires periodic health evaluation. Occupational health surveillance is targeted to specific at-risk groups as by workplace assignment, known exposure history and/or workplace monitoring data and

conducted by performing certain specific health examinations to include the following:

- a. Contractors, with the assistance of the Certified Monsanto Representative (CMR), shall identify potential health hazards or work conditions that may require medical surveillance examinations, and provide them to affected employees as required by governmental requirements. Some examples of medical surveillance examinations that are commonly required for performing work on Monsanto premises are:
 - Asbestos
 - Blood-borne Pathogens
 - Benzene
 - Cadmium
 - DMAC
 - Formaldehyde
 - Hazardous Substances Emergency Response
 - Hearing Conservation
 - Lead
 - Ionizing Radiation
 - Respiratory Protection
 - Hazardous Waste Operations and Emergency Response (HazWOpER)
- 2. Pre-placement health examinations shall be provided for contractor employees who are employed in jobs for which Monsanto required/legally mandated health examinations would be performed for its full-time employees (if they were to perform the job) and who:
 - a. Are, or may, be potentially exposed at or above the action level (i.e., one-half the eight-hour time-weighted average permissible exposure limit or Monsanto workplace exposure guideline) to a chemical/physical agent and situations as identified above; and
 - b. Are anticipated to work in a designated exposure area for 30 or more consecutive workdays or where non-consecutive work periods may result in sufficient cumulative work exposure to warrant evaluation. Such work evaluations will be conducted by Monsanto Industrial Hygiene in consultation with Occupational Medicine, DMHS, as to what constitutes sufficient cumulative work exposure; or
 - c. Regardless of work duration, are assigned to a job for which Industrial Hygiene, in consultation with Occupational Medicine, determines sufficient potential exposure to require health examinations.

- d. When there is any question as to whether or not the job assignment requires special health surveillance or any question as to the specifics of the health examination, Occupational Medicine, DMHS, is to be consulted and is the final authority.
- 3. This section is not intended to apply to potential exposures that might result from possible catastrophic events not reasonably foreseeable.
- 4. Where "baseline" medical data on contractor employees are required prior to working in area, sufficient lead-time for collection and analysis of samples is required in scheduling work.
- 5. Examinations are to be performed by qualified healthcare professionals and per applicable governmental regulations and requirements. Examination may be performed by healthcare professionals, identified by contractors, who meet the Monsanto Fundamental Requirement for Occupational Medicine R35 Qualifications and Responsibilities of the OM Professionals Supporting Company Sites or the approval of Monsanto DMEH.
 - Surveillance health examinations for contractor employees shall follow as closely as possible the examinations as defined for Monsanto employees.
 - b. The minimum overall qualifications for occupational medicine professionals include:
 - Formal training and completion of courses from a nationally or internationally recognized institution of education,
 - Fully licensed and able to practice under local, state and country laws,
 - No license suspensions or involuntary revocations in any state or country,
 - Compliance with Company fundamental requirements and ethical standards.
 - Fulfillment of continuing education for licensure and professional certifications,
 - Participation in local, state, and national professional associations,
 - Knowledge and skills related to the prevention and recognition of occupational disease, epidemiology, toxicology, ergonomics, worksite risk evaluation, disability, health surveillance, counseling,
 - Local labor and occupational medicine regulations

- c. More details information is in the applicable Fundamental Requirements for Occupational Medicine listed under Section 5.9.0.1 Paragraph 1.a. (above). Contact the CMR for more information or a copy of the Fundamental Requirement.
- 6. Periodic and exit physicals for contractor employees shall be in accordance with the same frequency/ timing practices provided for Monsanto employees similarly situated.
- 7. Maintenance and storage of medical record information on contractor employees will be at the discretion of the location and will follow the same policies regarding confidentiality and retention as for Monsanto employees. In all cases, whether the examination is performed on or off location, a copy is to be accessible to Monsanto medical personnel or be maintained by Monsanto in the same area as the medical records for that location are maintained. Where feasible, Monsanto forms are to be used.

Site Requirement *6.9.0
Revision Date: 12/01/09
Next Revision Date: 12/01/11
Revision: 3



5.0 Contractor/Guest ES&H Guidelines

5.9.1 Substance Detection

5.9.1.0 Monsanto General Requirements

- 1. Contractors classified as Low-Risk:
 - Contractors that are performing Low-Risk work are not required to have a substance abuse policy, unless required by the Monsanto location.
 - b. If the Certified Monsanto Representative (CMR) suspects a low risk contract employee is impaired due to alcohol, drugs or other substances, the contract employee will be asked to immediately leave the Monsanto location.

2. Contractors classified as High-Risk:

- a. Contractors performing High-Risk work shall comply with the location substance abuse policy established for contractors.
- b. Contractors shall have a documented program to assure that contract employees who work on Monsanto property are not impaired due to alcohol, drugs or other substances.
- c. In the event contractors are unable to provide either initial verification of drug-free employees or the location's required testing, the CMR may arrange for such services by or through Monsanto, but at the contractor's expense.
- d. Contractors shall provide the CMR with a summary of testing data on request.
- e. When an employee tests positive for substance impairment in required testing or is suspected of substance impairment, contractors shall:
 - Inform the CMR
 - Immediately remove the employee from the location

f. An employee who has tested positive for substance impairment shall not be allowed to return to any Monsanto location until the CMR has been provided verification and documentation that the employee has successfully completed a recognized substance abuse rehabilitation program.

Site Requirement *6.9.1

 Revision Date:
 12/01/09

 Next Revision Date:
 12/01/11

 Revision:
 4



5.0 Contractor/Guest ES&H Guidelines

5.9.2 Ergonomics

5.9.2.0 Governmental Requirements

General Duty Clause

Hazardous conditions or practices not covered in an OSHA standard may be covered under Section 5(a)(1) of the Occupational Safety and Health Act of 1970 which states: "Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."

5.9.2.1 Monsanto General Requirements

Contractors **should** have an Ergonomics Program in place that addresses, as a minimum, the following elements:

- 1. Provisions that address the specific control method for the ergonomic hazards present in the workplace.
- 2. A mechanism for reporting injuries/illnesses, symptoms, and hazards which may be related to ergonomics in the workplace, and for responding to such reports.
- 3. A process for evaluating the nature and causes of injuries/illnesses which may be related to ergonomics in the workplace and a process for identifying, implementing, and evaluating measures to reduce injuries/illnesses.
- 4. An element that demonstrates the program's provisions are effective in reducing the number and severity of workplace injuries/illnesses related to ergonomics of the number of ergonomic hazards.
- 5. A training component making employees aware of the ergonomics program and all if its key elements.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them. Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11 DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11 SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Guidelines

6.1.0 CONTRACTOR MANAGEMENT SYSTEMS

Contractors shall provide a full time Safety Representative in the following conditions:

- a.) When the contract company has 10 or more employees on site.
- b.) If they have less than 10 employees but the job has been defined as a high-hazard job through and ESH review, or if required by the Contractor Safety Specialist.
- c.) The full-time Safety Representative shall:
 - Have a minimum of three years experience in construction safety and have passed the OSHA 30 Hour Construction Course.
 - Must have Accident/Incident Investigation Skills
 - In some incidences, First Aid/CPR certification.
- d.) The Safety Representative shall be responsible for all subcontractors, and to ensure they are following ESH requirements.
- e.) The Safety Representative's primary responsibility will be to continuously monitor the contractor's personnel, the contractor's subcontractor personnel and equipment to ensure compliance with all applicable ESH requirements.
- f.) If the Safety Representative does not demonstrate the ability to perform his/her work to the satisfaction of the Monsanto Representative, the Monsanto Representative may ask that this person be replaced by another Safety Representative meeting the criteria listed above.
- g.) The Safety Representative must have the authority to correct any hazard or unsafe practice on the project, even if a work stoppage is required.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.1.1 EMERGENCY RESPONSE

Purpose:

This plan provides for the immediate organization of all efforts to prevent injury to personnel, damage to property and the environment, and to ensure accountability of employees.

Scope:

The plant Emergency Plan shall be used for any abnormal incidents that may occur inside of the Soda Springs Site including, but not limited to, personnel injury, or serious property or environmental releases, which have the potential to impact the surrounding community.

General:

Plant emergencies can be reported to PROVOX operators by dialing 777 on any plant telephone or by using plant radios.

The Plant Emergency Plan identifies two levels of plant emergencies:

Level One- Emergencies controlled by the on-site emergency response team.

Level Two- Any plant emergency that requires more resources than are available in the plant and/or environmental incident that would impact the surrounding area.

When upgraded to a level two incident, the furnace or kiln PROVOX Operator will be instructed to activate the plant emergency sirens, initiating plant headcount procedures.

The emergency sirens are tested every Friday at 12:00 noon.

HEADCOUNT:

When the sirens are activated, Mark III will report to the Mark III Shop for headcount.

On weekends, holidays and night shifts, Mark III personnel assigned to manufacturing areas should report to the designated manufacturing headcount area.

Temporary contractors/visitors are to report directly to the guard station used for entry into the plant (East ext. 1310 or West ext. 1480) for headcount reporting.

NorthWest Cleaning personnel assigned to work in remote areas of the plant (Furnace Office, E&I Shop, etc.) should immediately phone East Security to report headcount and receive further instructions.

If the contractor/visitor cannot report to the assigned guard station, proceed to the closest designated area (listed below) and report by phone or radio to your assigned area (the guard station). The CMR assigned to the contractor/visitor is responsible to inform them of emergency procedures and if possible escort them to the assigned headcount.

Plant Headcount Areas

- 1. #8 & 9 Furnace Tapping Lunchroom
- 2. #7 & 8 Furnace Operating Level Lunchroom
- 3. Phos Dock Lunchroom
- 4. Main Shop Lunchroom
- 5. Machine Shop Lunchroom
- 6. Electric Shop Lunchroom
- 7. HEG Lunchroom
- 8. Department 10 Lunchroom
- 9. Mark III Shop Lunchroom
- 10. Security Office (East Entrance)
- 11. Security Office (West Entrance
- 12. Admin. Building Multipurpose Room #59
- 13. Storeroom Conference Room

Evacution:

In the event the evacuation becomes necessary, the emergency plan indicates two levels of evacuation:

Partial Evacuation-Instructions will be delivered via radio, telephone or runner.

Full Site Evacuation-The emergency sirens will be activated a second and third time. Indicating the need for all personnel to proceed to the assigned evacuation collection areas as listed below:

Plant Evacuation Collection Areas

South Area: (As indicated by the assigned CMR)

Primary - Administration Building Multi-Purpose Conference Room. Secondary - HEG Shop

North Area: (as indicated by the assigned CMR)

Primary - HEG Shop Secondary - Administration Building Multi-Purpose Conference Room.

If you are outside of, or cannot safely reach your designated collection area, proceed to the assigned secondary collection area and report by phone or radio.

The CMR assigned to the contractor/visitor, if possible, should escort them to the assigned evacuation collection area.

EMERGENCY EQUIPMENT:

- 1. The use of designated fire equipment for activities other than fire fighting is prohibited.
- 2. Know the location of, and how to use, emergency equipment in the area where you are working. Emergency equipment includes safety tubs, showers, eye wash stations, stretchers, positive air equipment and fire extinguisher.
- 3. Any contractor performing work on a fire protection system must first obtain an Impairment Permit from the Safety Department. Fire protection systems include fire water supply systems, sprinkler systems, FM-200 systems, etc.
- 4. Never block emergency equipment such as fire hydrants, hoses, extinguishers, emergency vehicles etc.

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them. Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11 DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.1.3 TRAINING

- Contractors shall instruct each employee in the recognition and avoidance of unsafe conditions and regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury.
- 2. Contractors shall maintain records of all employees training. Training records shall contain, as a minimum:
 - a.) Name and signature of the employee
 - b.) Date of training
 - c.) Subject and content of the training
 - d.) Means used to verify that employee understood the training
 - e.) Name of the instructor
- When requested, the Certified Monsanto Representative shall be provided with documentation and certification of contractor training. In addition, the contract company must assure that all employees have the appropriate job skills, knowledge and proper technical certifications necessary to perform their work safely. Some certifications may include but are not limited to: Certified Welders, Crane Operators, Qualified Electrical Workers and Qualified Riggers. Monsanto reserves the right to audit Contractor Safety Training.

6.1.3 Training

Monsanto Internal

The document user is responsible to MAKE SURE PRINTOUTS ARE OF THE CURRENT REVISION, prior to using them. Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11 DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11 SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Guidelines

6.1.4 ENGLISH PROFICIENCY

1. All contractors must have the ability to read and speak English in order to perform their work safely.

6.1.4 English Proficiency

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.2.0 WORKING IN AN OPERATING UNIT

Department Hazards

- 1. No one shall enter another department to perform work or use that department's equipment without first obtaining permission from that department's Operating Crew Supervisor.
- 2. No unauthorized person should ever start up or shut down a piece of equipment in any department (unless danger to another person's life exists).
- 3. Owning department will be responsible for clearing/isolating all process lines as well as initiating any and all required hazardous work permits.
- 4. Never reach under or between belts, pulleys, idlers, rollers, chains, gears, etc., unless the equipment is locked out.
- 5. Equipment shall not be operated without proper guards and safety chains in place.
- 6. Only qualified members of the Monsanto Electrical Department will open electrical boxes to remove fuses, energize resets or to perform other electrical functions. Electrical contractors must first get clearance from the Monsanto Electrical Department to perform any electrical work. The use of Ground Fault Circuit Interrupters is required when using tools.
- 7. Due to the high potential of injury resulting from the uncontrollable whipping of an air hose, which has unexpectedly uncoupled, whip checks will be required when using tools such as jackhammers and air drills.
- 8. Whip checks are also required when doing any high pressure water blasting. There are two types of whip checks available from the plant Storeroom.

- 9. All snap-on hose connections must be secured by wire pins.
- 10. No one shall use compressed air to clean his or her clothing or body. Compressed air shall not be directed toward anyone.
- 11. Compressed air shall not be used for cleaning purposes except when reduced to less than 30 P.S.I., or when a venting device is used along with all appropriate personal protective safety equipment. Note: Use industrial vacuums whenever possible.
- 12. Department Supervisor's approval must be obtained before using steam or air to unstop a pipe or line.
- 13. When working with Soda Ash or Lime; goggles and dust mask or respirators with Hepa filters are required.
- 14. Any cam-lock fitting used on Soda Springs Sites must be secured with a secondary safety device such as wire ties, pins, etc., or other means to prevent inadvertent disconnection.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.2.1 OFFICE SAFETY

- 1. The following items, while not intended to be all-inclusive, are indications of some of the areas of concern for good office safety:
 - a. Never carry pencils with points exposed in shirt pockets.
 - b. Report spills, slipping and tripping hazards to the supervisor immediately. Clean up or correct them as soon as possible.
 - c. Keep all machinery guards in place.
 - d. Never leave paper cutter arm in an up, or open position.
- 2. The following items, while not intended to be all-inclusive, are indications of some of the areas of concern for good office housekeeping:
 - a. Do not store used equipment in office.
 - b. Do not stack large amounts of paper, and other items, on the tops of file cabinets, bookcases and tables.
 - c. Clear desk and table tops at the end of each workday.
 - d. Use coat racks or closets for coats and surplus clothing.
 - e. Limit wall hangings to what is appropriate.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.3.1 BASIC ENVIRONMENTAL SAFETY AND HEALTH RULES

Working safely is a condition of employment at this plant. Each employee (Monsanto & Contractor) must comply with the plant's safety rules and policies. Knowledge of these specific rules and policies is mandatory in order to perform work safely. In general, plant rules are provided to help insure everyone's safety. The following site-specific rules are provided to address specific safety concerns that are unique to our plant.

- 1. The best insurance against incidents and injuries:
 - a) Know the job, the pertinent safety rules and area hazard.
 - b) Keep focused, and your mind on the work at hand.
 - c) Use common sense.
 - d) If you can't do it safely, don't do it.
 - e) If you don't know, don't be afraid to ask.
- 2. Only approved hard hats (ANSI 289.1-1969), which are equipped with goggles, shall be worn inside the plant.
- 3. Long hair below the nape of the neck must be pinned up or worn in a ponytail.
- 4. Radios, televisions, and cameras require permission from the Site Manager before being brought into the plant. The use of a cell phone camera for taking pictures requires permission from the Site Manager.
- 5. All individuals have a direct responsibility to immediately report unsafe acts or conditions to supervision. This includes reporting any near misses including, but not limited to: unexpected equipment condition, defeated

- safety systems, or other process safety or personal safety items. If a potential injury is imminent, an attempt must be made to stop the unsafe act or condition, and report it through the use of the corrective action form.
- 6. It is the responsibility of the CMR to explain area hazards to the contractor before the contractor performs any work.
- 7. All "Hot" work will cease if the plant disaster alarm is sounded. (This includes cigarette smoking).
- 8. Eating or drinking is prohibited in production areas (designated eating areas are provided).
- 9. Contractors must observe safety signs while on Monsanto property.
- 10. Contractors performing work inside the main office, service building, laboratory or storeroom, will wear the appropriate safety protection (to be identified by the Safety Department).
- 11. Always use handrails when going up and down stairs. Remember the 3-point contact.
- 12. Objects or equipment must never be placed within 3 feet of electrical boxes or disconnects.
- 13. Equipment shall not be operated within 15 feet of power lines.
- 14. A full-face cutting hood or a face shield with goggles is required when using a cutting torch.
- 15. A face shield with goggles is required when doing any kind of grinding, cutting, sanding, water blasting, sawing, hammering or chipping that might have the potential for flying debris.
- 16. BUTANE lighters are not allowed in the plant.
- 17. No one under the age of eighteen may work on Monsanto property. This includes contractors and sub contractors.
- 18. Contractors should avoid strains when lifting by keeping their back as nearly upright as possible, using leg muscles instead of the back and stomach muscles. They should not attempt to lift more than 50 lbs per person without assistance.

PERSONAL CONDUCT:

Certain rules of personal conduct on the job are necessary for the successful operation of any organization. Some of the things that are prohibited while on Monsanto property are:

- 1. Smoking at Safety Meetings, in offices, or at any Monsanto function being conducted indoors.
- 2. Bringing intoxicating liquor or narcotics into the plant, or entering the plant under the influence of liquor or drugs, drinking or using narcotics on company property.
- 3. Bringing firearms or any type of explosive into the plant unless approved by the Site Manager.
- 4. Engaging in fights, horseplay, practical jokes or indecency.
- 5. Willfully damaging plant or personal property.
- 6. Using threatening or abusive language toward fellow employees or supervision.
- 7. Stealing.
- 8. Gambling on plant property.
- 9. Posting notices on company property without prior approval of Plant Management.

The above general rules cannot possibly cover all situations that might arise. As a rule of thumb however, it can be assumed that contractor/visitors are not to engage in any activity that interferes with another employee's or group of employees work, or engage in activity that interferes with the normal continuity of plant operations or the maintenance of order on its premises.

JEWELRY POLICY:

- 1. Rings, metal band watches, bracelets and necklaces will not be worn in the plant, quarry, storeroom, lab or mine.
- 2. Rings, metal band watches, bracelets and necklaces will not be worn when performing maintenance/electrical work on plant property.

- 3. Hoop: earrings, nose-rings and brow-rings will not be worn in the plant, mine quarry, storeroom or lab or when performing maintenance/electrical work on plant property.
- 4. Stud jewelry is allowed.
- 5. Medical alert necklaces and bracelets are allowed, and will be kept under clothing when performing maintenance.

CELL PHONE POLICY - such as talking, texting, and gaming is PROHIBITED:

- 1. When driving any motorized vehicle on Monsanto property.
- 2. When walking in "out of office" areas throughout plant and remote sites. (Take the call only when stopped in a safe area.)
- When working in an area where a hazardous work permit exits; however, in this circumstance, a cell phone may be used for business and/or emergencies only.
- 4. Employees, contractors and visitors are asked to use good judgment when using their cell phones in manufacturing areas of the Soda Springs plant. Do not allow a cell phone to distract or otherwise cause inattention while performing a task. Keep your mind on your work until you can safely answer a call.
- 5. The best time to use cell phones for personal business is break time.

BARRICADE TAPE POLICY:

All excavations, holes in floors, areas where work is being performed overhead or temporary work areas where tripping or falling hazards exist will be covered over, roped off, or barricaded off. It is important that the proper barricade tape in conjunction with the proper tag be used when barricading an area. The Soda Springs plant uses two types of barricade tape: yellow & black barricade tape and orange barricade tape.

All barricade tape must be tagged with either a DANGER tag or a CAUTION tag. The DANGER tag or the CAUTION tag must include a description of the hazard, be signed by the person establishing the barricade, be placed on the barricade tape and be spaced frequently enough for easy identification.

 Orange barricade tape is to be used to barricade an area, which has been determined to be hazardous for entry. Orange barricade tape is considered the same as a lockout. Once the orange barricade tape has been put up, NO ONE IS ALLOWED TO ENTER THAT AREA, not even the person who applied the barricade tape. A DANGER tag must be attached to the barricade tape as described in #3 of this section. CAUTION tags are NOT to be used with orange barricade tape. Once the hazard has been identified and all safety precautions are taken to correct the hazard, the orange barricade tape can be taken down and replaced with yellow & black barricade tape (if necessary) so that work can proceed.

- 2. Yellow & black barricade tape is used to identify an area where a hazardous condition may exist. Either CAUTION or DANGER tags, as described in #3, may be used with yellow & black barricade tape.
- 3. CAUTION tags are used, entry into the barricaded area may occur, after reading the warning on the CAUTION tag. If DANGER tags are used, entry into the barricaded area can only occur after requesting permission from the person who established the barricade. If work proceeds beyond shift change, the CAUTION or DANGER tags must be replaced and signed by the oncoming shift.
- 4. All barricade tape is to be promptly taken down when the reason for the barricade no longer exists. Barricade tape is to be placed in trash containers when it is removed. Barricade tape is NOT to be left lying on the ground in the work area.
- 5. All open holes in the floor must be surrounded by barricade tape.

PEDESTRIAN TRAFFIC:

- Pedestrians must use designated walkways and be aware of the beeping signal from backing equipment. They should also be aware of the limited visibility of heavy equipment operators.
- 2. Stay a safe distance from a moving piece of equipment until the attention of the operator has been gained.
- 3. Running up or down stairways or throughout the plant unnecessarily is not allowed.
- 4. Do not sit on handrails or lean on safety chains.
- 5. Never enter pot carrier area, nodule stockpile area, or the belt filter press cake/ore screen house area, without proper clearance.

RAILROAD SAFETY:

1. Cross railroad tracks only at regular crossings provided for that purpose. If railroad cars are blocking a road or passageway, do not climb over, between, or under them instead, walk around them.

- You should allow at least eight feet of clearance between you and the car.
 This rule is in effect at all times whether or not a switch is being made.
 Anyone violating this rule will be subject to disciplinary action.
- 3. No one shall place material, equipment or do work within 8 feet of the center line of any railroad track without first contacting the Material Handling Department and/or Phos Dock personnel to have the tracks Blue Flagged and Locked Out.

BLUE FLAG

- 1. Whenever anyone is working around a railroad car at the phos dock, railroad shop, coke bunker(s), or anywhere on the plant tracks, a Blue Flag must be in place on the southernmost car on the affected track.
- 2. Keep derail closed at all times except when switching railroad cars.
- 3. Chock the wheels on lead car on a downgrade.
- 4. Any person(s) working in a railroad car area shall use a Blue Flag sign. Ownership and clearing of plant railroad tracks will be as follows:

RR track ownership:

Heavy Equipment Group – Track 721, commonly known as track #1. Phos dock – Track 722, commonly known as phos loading track #2. Reliability group (Railroad Shop) – Track 723, 724, 728.

Note: Work by the (authorized) **owning track group** requires a Blue Flag only.

Note: Work by the (affected) **non-owning employees** requires the use of some type of control method in addition to the blue flag. For example, a tag lock and tag, or lockbox must be used by both the owning track group and non-owning employees. This will ensure that all involved groups are recognized and that communication is maintained.

- 5. In the event that work is to be performed on a track by a group other than the owner, contact must first be made with the track owner and lockout tag affixed to the blue flag.
- 6. Persons needing to work across or within eight feet of the phos loading track shall contact the phos dock Crew Supervisor or backup, and fulfill the following requirements.

- a. The phos dock will place a tripod Blue Flag sign at the south end of the phos loading track. The phos dock and persons performing the work on or near the tracks must lock out the car puller if there are any cars to the north of where the work is to be performed.
- b. Skates or chocks will be used on the first car on either side of the work area.
- c. Non-phos dock person(s) performing the work will affix a lockout tag bearing his/her name to the Blue Flag tripod sign. This is necessary to move rail cars before the work is completed. If a lockbox is being used then a tag must be affixed to the blue flag indicating that a lockbox is being used.
- d. Work should be completed as promptly as possible to minimize any impact on loading and switching activities. When work is complete and the tracks clear, notification should be made immediately to the phos dock. The lockout tag must be removed from the tripod sign and the car puller if locked should be unlocked.
- e. In the event that work extends beyond the end of the phos dock personnel's shift, a special written permit will be issued by the phos dock to authorize removal of the Blue Flag. This permit will contain a checklist for the person removing the Blue Flag who may not be familiar with the procedure to assure that the track is cleared.
- f. No one may remove a Blue Flag from the phosphorus-loading track other than the phos dock or the holder of a written permit.
- g. No one shall remove a Blue Flag bearing a lockout tag.

WORK-IN PROGRESS/ PERFORMANCE EVALUATIONS:

 Contractors must participate in work-in-progress audits when asked to by the Monsanto Representative.

WAPITI/ BEHAVIORAL BASED SAFETY PROCESS:

- Contractors will be asked to participate in the BBS Process.
- The BBS process identifies behaviors, which may lead to an injury or property damage.
- BBS is part of the safety culture and is an important part of changing an unsafe act.

HAZARDOUS ENTRY AND GENERAL ENTRY PROCEDURES:

A properly completed and approved hazardous work permit is required prior to performing hazardous jobs, entering vessels or entering designated confined spaces in the plant. The department Crew Supervisor may issue hazardous work permits or a responsible operator, provided the conditions of the hazardous work permit can be met. Otherwise, the job must stop until the permit can be properly completed and approved or a special written clearance is obtained.

- Hazardous work permits are only valid during the shift in which it was created. If the work proceeds past the end of the shift, a new hazardous work permit must be completed.
- 2. Hazardous work permits must remain at the job site until completed and then should be returned to the operating crew supervisor.
- Only Monsanto Employees are authorized to start/stop equipment or open/close valves. When these steps are needed, contact your assigned CMR.

NOTE: Nitrogen and inert gas are used to purge oxygen from most vessels in the plant. Inert gas sometimes contains hazardous amounts of Carbon Monoxide. Breathing pure nitrogen or inert gas can be fatal.

Permits:

There are many different permits in this plant that have been developed to assist in performing safe operations. It is the responsibility of each individual to know when and where a permit is required to perform a job. If in doubt about the need for or use of a permit, ask the CMR who represents you. Listed below are some of the permits that are used at this site. This list is not all-inclusive other permits maybe necessary and your assigned CMR will assist you in determining permits you need to complete your assigned work:

- 1. Hot Work Permit
- 2. Work Execution Permit
- 3. Confine Space Entry Permit
- 4. Line Entry Permit
- 5. Lifting Personnel with Crane Permit
- 6. Elevated Work Permit
- 7. Excavation Permit

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.3.5 INJURY AND ILLNESS RECORDKEEPING AND REPORTING

The Plant Dispensary is available for initial treatment of injuries, which occur on company property. The plant has a trained 24 Hour Emergency Response Team and EMT's for rescue work. Call 777 for emergency first aid support. Be sure to give your name, the location of the injured, and, if possible, the extent of the injury. Go or send someone to direct the emergency crew to the exact location of the injury.

- 1. Contractors/visitors are required to immediately report all injuries, no matter how small, to the CMR and Safety Department or on-shift EMT. A First Aid card (blue/Contractors) must be filled out immediately for any first aid or injury. Any transport to the hospital requires a blue first aid card to accompany the injured/ill employee. MD information is required on the back of the card. The first aid cards are located in the Administration Building Dispensary. The CAF (corrective action form) is attached and must also be submitted.
- 2. Contractors are required to submit a monthly Man-Hour & Illness/Injury Report to the Contractor Safety Specialist.
- 3. If you are personally exposed to blood/body fluids, immediately wash exposed area with soap/water, isolate the contaminated area, call EMT's to perform decontamination, and report exposure to the Safety Department.
- If blood/body fluids are discovered (without personal exposure), isolate the area from other personnel and call Plant EMT's to perform decontamination procedures.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.4.4 MONSANTO SECURITY POLICY

- Contractors and their employees normally will be governed by the terms of their particular contract. In all cases, contractor's personnel are confined to the area in which they are working.
- 2. Contractors and their employees will use the entrance and exit gate, which has been designated by Monsanto.
- 3. Service Representatives and Service Company employees who are not under a formal contractual arrangement will be registered in and out. The plant guards will administer the above policy and enforce the necessary rules required to carry it out.
- 4. Contractor parking facilities will be separate from Monsanto Employee parking.
- 5. An approved Material Pass will be required for contract employees and visitors when leaving company property with bundles, packages, boxes, materials, equipment, etc. Plant guards may periodically inspect packages, even though the individual may have a Material Pass. Lunch boxes do not require a pass, but must be opened for inspection upon request. Vehicles leaving the plant are also subject to inspection at any time.
- 6. Each contractor's employees and/or visitors will be required to identify him or herself when entering or leaving company property. This shall include signing the log in the guard station.
- 7. Only the Plant Manager or their delegate can authorize the use of cameras, camera equipment or cell phone cameras. They will not be permitted within the plant without this authorization. Any photographs or video taken of the facilities will need the same authorization.

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11

SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.9.1 SUBSTANCE DETECTION

General Requirements:

In the general requirements for Low-Risk and High-Risk contractors, refer to 5.0 Contractor/Guest ES&H Guidelines, 5.9.1 Substance Detection.

This policy is in effect for all Monsanto Soda Springs locations including the Rock Springs, Wyoming Calciner facility, and all affiliated off-site mining operations and properties (hereinafter referred to as Soda Springs Facilities).

Contractors that do not have a substance abuse policy consistent with these guidelines will not be allowed in a Soda Springs facility without a Monsanto management exception.

All contractors have been classified into one of two categories, High-Risk or Low-Risk. This classification was determined as to the type of work that the contractor performs at Soda Springs Facilities.

Requirements for Both Low-Risk and High-Risk Contractors:

Low-Risk and High-Risk contractors must maintain a copy of an executed **Substance Abuse Policy Statement (Exhibit A)** for each contract employee who works at a Soda Springs Facility; and

Low-Risk and High-Risk contractors must present at the time of site orientation an executed **Substance Abuse Policy Statement (Exhibit A)** for each contract employee undergoing site orientation.

If the Certified Monsanto Representative (CMR) suspects any contract employee is impaired due to alcohol, drugs or other substances, that contract employee will be asked and required to immediately leave the Soda Springs Facility and not return until that contract employee has undergone a substance abuse test verifying that he or she is, in fact, substance free.

Additional Requirements for High-Risk Contractors:

A. Testing Program: All High-Risk contractors must implement one of the two following substance abuse testing programs, although please note that Monsanto prefers that its High-Risk contractors implement the first option:

Option One: Contractor must execute and provide to Monsanto the Contractor Employer Substance Abuse Verification (Exhibit B) and must implement a substance-abuse testing program that contains the following elements:

- Prior to Working at Soda Springs Facilities Contractor must have a program that documents that each contract employee working at a Soda Springs facility has passed a substance-abuse test prior to that individual starting work at any Soda Springs Facility.
- 2. Random Testing Contractor must have a documented program providing evidence that at least 35 percent of its work force who have worked at Soda Springs Facilities has been randomly tested during the prior year. The testing of the 35 percent must occur evenly over an annual time frame. Testing all personnel on a single day does not qualify as random.

Option Two: Contractor must execute and provide to Monsanto the Contractor Employer Substance Abuse Verification (Exhibit B). Within 15 days prior to any contract employee beginning work at the Soda Springs Facilities, and within six months of any previous test, Contractor must test that individual and maintain executed Contractor Employee Substance Abuse Verification(s) for that test(s). Contractor will provide to Monsanto a copy of the executed Contractor Employee Substance Abuse Verification (Exhibit C) at the time of that individual's site orientation. This testing requirement applies for as long as the contract employee continues to work at the Soda Springs Facilities. If there is a 45-day lapse in any assignment to the Soda Springs Facilities for any particular contract employee, contractor must test that individual within 15 days prior to him or her restarting work at the Soda Springs Facilities.

B. Test Requirements: The substance abuse testing conducted pursuant to the above guidelines must be for the following listed substances (or other such substances as indicated in writing by Monsanto) at levels set forth in the Federal Register of Health and Human Services Guidelines published in the Federal Register on April 11, 1988 [53 F.R. 11970], and any amends thereto.

Amphetamines
Cannabinoids (THC)
Cocaine Metabolite
Opiates
Phencyclidines

All tests shall be performed in a Substance Abuse and Mental Health Services Administration (SAMHSA) certified laboratory.

- C. Positive Results: If a contract employee tests positive for substance impairment or contractor suspects a contract employee of substance impairment, contractors shall:
 - 1. Immediately remove the contract employee from the Soda Springs Facilities.
 - 2. Inform the CMR Leader and Purchasing Lead.

A contract employee who has tested positive for substance impairment shall not be allowed to return to the Soda Springs Facilities until the CMR Leader or Purchasing Lead has been provided verification and documentation that the contract employee has successfully completed a recognized substance abuse rehabilitation program.

EXHIBIT A

SUBSTANCE ABUSE POLICY STATMENT

Employee Name:	
Contractor Name:	("Company")
In connection with your employment, you may be Company's client, Monsanto Company ("Monsanto	
The use, possession, sale and distribution of unauthorized substances, or the presence of Company's drug testing programs for such subsprohibited on any Monsanto work location, including among others, marijuana, hashish, heroin, crack/c	an individual testing positive under stances for non-medical reasons, are ng project sites. Illegal drugs include,
Entry to any Monsanto work location, including conditional on Monsanto's right to search the entroprohibited drugs and paraphernalia, alcoholic beverproperty or equipment. The Certified Monsanto Fremove any contract employee from any of the So abuse test can verify that the contract employee is	rant's personal effects and vehicle for erages, or possession of unauthorized Representative (CMR) has the right to da Springs Facilities until a substance
Violation of this policy or refusal to submit to a seimmediate termination of Permission/Authorization agree to abide by Monsanto's reasonable suspicion	n to work on Monsanto's premises. I
I HAVE READ AND UNDERSTAND THE ABOVE	POLICY.
Employee Signature	Date

EXHIBIT B

CONTRACTOR EMPLOYER SUBSTANCE ABUSE VERIFICATION

I hereby certify that our Company substance abuse program meets the standard set forth in the Monsanto Soda Springs site-specific document 6.9.1 as outlined in Option One or Two. I also agree to periodic audits of our substance abuse testing program to provide evidence that the program is in conformance.

Our selected option for the Soda Springs Site High Risk Contractor is:

Option One	_ Option Two
Name of Contract Company:	
Printed Name:	
Signature:	
Title:	
Date:	

Please fax or return the above information:

Monsanto Company
Attn: Matt Kirby
(208) 547-1253 Office
(208) 547-3763 FAX
sodasprings.contractor-guest@Monsanto.com

EXHIBIT C

CONTRACTOR EMPLOYEE SUBSTANCE ABUSE VERIFICATION

lame of Employee:				
ast four digits of Social Security Number:				
Date Sample Taken:				
Name of Testing Laboratory:	_			
est Utilized:				
Negative Test Results* Yes No*Do Not Send Actual Test Results				
I HEREBY CERTIFY THE ABOVE TEST RESULTS TO BE CORRECT TO THE BEST OF MY KNOWLEDGE.				
Name of Contract Company:	_			
Printed Name:				
Printed Name:				

Please fax or return the above information:

Monsanto Company
Attn: Matt Kirby
(208) 547-1253 Office
(208) 547-3763 FAX
sodasprings.contractor-guest@Monsanto.com

Soda Springs Contractor/Guest ES&H Guidelines 6.0 Site Requirements Document ID #CG001 Revision 11

DOCUMENT CONTROL INFORMATION: Document ID #CG001-Rev 11 SODA SPRINGS CONTRACTOR GUEST ES&H Guidelines 6.0 Site Requirements

APPROVER: KIRBY, MATT K. - Contractor Safety Specialist REVISION COMMENTS: Update procedure to current practices.



6.0 Contractor/Guest ES&H Site Guidelines

6.0 Table of Contents

Requirement Number	Title
6.1.0	Contractor Management Systems
6.1.1	Emergency Response
6.1.3	Training
6.1.4	English Proficiency
6.2.0	Working in an Operating Unit
6.2.1	Office Safety
6.3.0	Housekeeping
6.3.1	Basic Environmental, Safety and Health Rules
6.3.2	Personal Protective Equipment
6.3.5	Injury and Illness Recordkeeping and Reporting
6.3.7	Hand Tools
6.3.8	Scaffolding
6.3.9	Stairways and Ladders
6.3.10	Abrasive Blasting
6.3.11	High Pressure Water Blasting
6.3.12	Welding, Cutting and Brazing
6.3.13	Slings, Chain falls and Come-Along
6.3.14	Compressed Gas Cylinders

6.0 Table of Contents

Monsanto Internal



6.0 Contractor/Guest ES&H Site Guidelines

6.0 Table of Contents

Requirement Number	Title
6.4.0	Fire Protection and Prevention
6.4.4	Monsanto Security Policy
6.5.1	Confined Space Entry
6.5.3	Lockout and Tagging
6.5.4	Electrical Safety
6.5.5	Hot Work Permit
6.5.7	Trenching and Excavation
6.5.9	Fall Protection
6.6.2	Hearing Conservation
6.6.3	Respirator Protection
6.6.4	Hazard Communication
6.6.5	Asbestos Abatement
6.6.7	Lead Exposure
6.6.8	Radiation Safety
6.7.1	Cranes and Hoisting Equipment
6.7.3	Mobile/Powered Construction Equipment
6.8.0	Waste Management
6.9.1	Substance Detection

APPENDIX C TECHNICAL PROCEDURES

TECHNICAL GUIDELINE FOR COLLECTION OF GROUNDWATER QUALITY SAMPLES TG-1.2-20

Rev. #3 8/20/2009



Table of Contents

1.0	ΡU	RPOSE1
2.0	API	PLICABILITY1
3.0	DE	FINITIONS1
3.1.	Dec	dicated Pump System1
3.2.	We	Il Bore Storage Volume1
3.3.	Bai	ler1
3.4.	Nor	n-Dedicated Sampling Apparatus
3.5.	Gro	oundwater Sample
3.6.	Pos	sitive Pressure Pump1
3.7.	Neg	gative Pressure Pump1
3.8.	Sar	mple Bottles2
3.9.	Acc	ceptable Material2
3.10	. Per	missible Pump2
4.0	DIS	CUSSION2
5.0	RE	SPONSIBILITIES2
5.1.	Sar	mpling Technician2
5.2.	Tas	sk Leader3
5.3.	Pro	ject Manager3
6.0		UIPMENT AND MATERIALS3
7.0	GU	IDELINE
7.1.	Gei	neral Considerations
7.	1.1.	Regulatory Considerations
7.	1.2.	Decontamination
		Sample Quantities, Types, and Documentation
7.	1.4.	Sample Containers
7.	1.5.	Acceptable Materials
		Sample Acquisition
7.2.	Gro	oundwater Sample Acquisition6
7.	2.1.	Floating or Sinking Non-Aqueous Fluids
7.	2.2.	Purging the Well
7.	2.3.	Samples for Major Cation, Metal and Metallic Radionuclide Analyses
7.	2.4.	Samples for Semi-Volatile Organics Including Extractable Base-Neutral/Acid Compounds Phenolic Compounds, Pesticides, PCBs and Herbicides
7.	2.5.	Samples for Purgeable Volatile Organics
7.	2.6.	Samples for Cyanide Analyses
7.	2.7.	Samples for Major Anion and Biological Oxygen Demand (BOD) Analyses







TG-1.2-20 samples

Collection of groundwater quality

7.2.8	. Samples for Total Phosphate and Orthophosphate Analyses	8
7.2.9	. Samples for Total Phosphorus, Nitrogen Compounds, Chemical Oxygen Demand, Organic Carbon, and Total Organic Halogen Analyses	
7.2.1	0. Samples for Analysis of Total Dissolved Solids	9
7.2.1	1. Samples for Oil and Grease or Hydrocarbons	9
7.2.1	2. Samples for Fuel Fingerprinting	9
7.3. Fi	eld Analyses	9
7.3.1	. Calibration of Instruments	9
7.3.2	. Water Temperature	10
7.3.3	pH Measurement	10
7.3.4	Conductivity Measurement	10
7.3.5	. Dissolved Oxygen Measurement	10
7.3.6	. Turbidity Measurements	11
7.3.7	. Redox Potential Measurements	11
7.4. Ca	apture and Disposal of Purge Water and Decontamination Solutions	11
7.4.1	. Purge Water	11
7.4.2	Decontamination Waste Solutions	12
7.5. Do	ocumentation	12
7.5.1	. Sample Labels	12
7.5.2	. Groundwater Sample Collection Forms	12
7.5.3	. Chain of Custody Records	12
7.5.4	. Field Report Forms	13
7.5.5	. Sample Integrity Data Sheet	13
7.6. Fi	eld Change Request	13
8.0 RI	EFERENCED GUIDELINES	13
9.0 AI	DDITIONAL GUIDELINES AND PROCEDURES	13

List of Tables

Table 1 Sample Container Codes, Types, Volumes, Preparation, Special Handling, Preservation, Holding Times

List of Exhibits

EXHIBIT A Sample Labels

EXHIBIT B Groundwater Sample Collection Forms

EXHIBIT C Chain of Custody Record

EXHIBIT D Field Report Form

EXHIBIT E Sample Integrity Data Sheet

EXHIBIT F Field Change Request Form





1.0 PURPOSE

This technical training guideline establishes a standard methodology for collecting groundwater samples for chemical analysis that are representative of aquifer water quality.

2.0 APPLICABILITY

This technical training guideline is applicable to field personnel engaged in the collection of groundwater samples from wells for purposes of chemical analysis. This document should be read in conjunction with any and all regulatory, workplan, order, client specific, and other project-specific guidelines.

3.0 DEFINITIONS

3.1. Dedicated Pump System

A dedicated pump system is a permanently installed device for removing water from a well. The system is not removed from the well and does not have the potential to become cross-contaminated between uses.

3.2. Well Bore Storage Volume

Well bore storage volume is defined as the volume of water enclosed by the well casing and screen gravel/sand pack at equilibrium.

3.3. Bailer

A bailer is a tubular device with a check-valve at the top and/or bottom for collecting and removing groundwater from wells.

3.4. Non-Dedicated Sampling Apparatus

Non-dedicated sampling apparatus is sampling equipment that may contact groundwater samples from more than one well. This term is also used to describe equipment that is only used for sampling a single well, but is removed from the well and could potentially become contaminated.

3.5. Groundwater Sample

A groundwater sample is defined as water acquired from a well for analyses of chemical or biological parameters that is representative of groundwater within the aquifer or the portion of the groundwater in the subsurface being sampled.

3.6. Positive Pressure Pump

A positive pressure pump is a device for removing water from a well by forcing water to the surface through positive pressure when operated below the well's water level. A positive pressure pump may be operated electrically, mechanically, or by gas pressure. Submersible impeller, bladder, and check valve pumps are common types of positive pressure pumps.

3.7. Negative Pressure Pump

A negative pressure pump is a device for removing groundwater from a well by suction (negative pressure). Peristaltic and centripetal pumps are common types of negative pressure pumps. The limitation for lifting water by suction is usually 20 to 25 feet. These pumps are typically only acceptable



for non-volatile analytes and analytes that are not affected by aeration or changes in pH or pressure. They are useful as purging devices for shallow groundwater wells.

3.8. Sample Bottles

Sample bottles are containers specifically designed and prepared for storing aliquots of a sample. Sample container type, material, size, and type of lid are specific for particular groups of analytes. Sample bottles must typically be properly cleaned and prepared by a certified laboratory.

3.9. Acceptable Material

Acceptable materials are defined as the only materials that are allowed to contact groundwater samples, and are dependent on the analytes being tested.

3.10. Permissible Pump

Permissible pumps are defined as pump systems that have acceptable effects on water quality when used to obtain groundwater samples from wells. The use of permissible pumps is dependent on the analyses being conducted on the acquired samples. The parts of permissible pumps that will contact the groundwater sample contain only acceptable materials.

4.0 DISCUSSION

In order to generate appropriate, quality data using these guidelines, it is incumbent on the field personnel to have reviewed these guidelines as well as other referenced and/or pertinent technical guidelines. This document should be read in conjunction with any and all regulatory requirements, site-specific work plans, administrative orders, and client-specific or other project-specific guidelines.

Groundwater samples shall be collected in quantities and types as directed by the Project Manager and project work documents. If applicable, sampling or monitoring shall be conducted for any potential floating immiscible layers prior to well purging and sampling. All instruments used for field analyses shall be calibrated in accordance with appropriate guidelines. The guidelines in Golder Associates Quality Procedure QP-1, "Calibration and Maintenance of Measuring and Test Equipment" may be applicable, however it is important to be familiar with local regulatory and project-specific requirements.

All non-dedicated sampling equipment shall be decontaminated before and after each use. If directed by the Project Manager or as specified in project work documents, purge water and decontamination fluids shall be captured and contained for disposal. Samples shall be collected in properly prepared containers of the appropriate size and type (see Table 1). All samples shall be appropriately labeled and sealed (see Exhibit A) an appropriate groundwater sample collection forms (Exhibit B) must be used to document raw field information for each sample. Chain of custody (see Exhibit C) shall be maintained in accordance with guideline TG-1.2-23, "Chain of Custody." The Field Report Form (see Exhibit D) and Sample Integrity Data Sheet (see Exhibit E) and bound field notebooks shall be used to document daily site activities and sample collection. All variations from established guideline shall be documented on the Field Change Request (see Exhibit F) and shall be approved by the Project Manager.

5.0 RESPONSIBILITIES

5.1. Sampling Technician

The Sampling Technician is responsible for sample collection, sample custody in the field, preservation, field testing, total and accurate completion of data sheets, sample shipment and delivery of data to the Project Manager, all as described in this technical guideline.



5.2. Task Leader

The Task Leader is responsible for supervising Sampling Technicians. Supervision includes ensuring that samples are collected, documented, preserved, field analyzed, handled and shipped to the appropriate laboratory as specified in project work documents and this technical guideline. In many cases, the Task Leader will also fill the role of the Sampling Technician.

5.3. Project Manager

The Project Manager has overall management responsibilities for the project, is responsible for designing the sampling program, for arranging the logistics of the program, and for providing any required clarifications in the use of this guideline.

6.0 EQUIPMENT AND MATERIALS

If wells are equipped with permissible and dedicated pump systems, equipment to operate the dedicated pump systems (i.e., air compressor, compressed air or nitrogen cylinders, electric generator, etc.); non-dedicated sampling apparatus such as surface discharge tubing and valving; or bailer(s) for sampling free floating product may be necessary.

If wells do not have permissible and dedicated pump systems, permissible pump systems or bailers and accessories of small enough diameter to enter the wells will be necessary. All equipment that could contact the sample shall be made of acceptable materials.

Additional supplies should include: sample bottles, properly cleaned and prepared by a certified laboratory with preservatives appropriate for the parameters to be sampled.

Field test equipment

- multi parameter meter and calibration standards (meter should be capable of measuring pH, specific conductance, redox, dissolved oxygen and temperature);
- turbidity meter and calibration standards;
- flow through cell for collection of field measurements;
- Filtration apparatus (0.45 micron and prefilter), if necessary;
- Depth to water measuring device;
- Interface probe if necessary;
- Well specifications;
- Sample labels and seals (Exhibit A);
- Groundwater Sample Collection Forms (Exhibit B);
- Chain of Custody Forms (Exhibit C);
- Field Report Forms (Exhibit D);
- Sample Integrity Data Sheet (Exhibit E);
- Coolers and ice packs or wet ice contained in zippered plastic bags;
- HPLC/distilled/deionized/Type II water as necessary;





- Isopropyl alcohol;
- 1% solution of trace metal grade nitric acid;
- Cleaning equipment and solutions;
- Indelible ink pens;
- Field notebooks;
- Container(s) for capturing, containing, treating and measuring waste decontamination solutions, if necessary;
- OVA or OVM with accessories and calibration gases;
- As required, 55 gallon steel drums fitted with bung holes, or suitable vessels(s) for containing purged groundwater;
- Field Change Request (Exhibit F);and
- Appropriate PPE, notably suitable gloves for handling samples. Various gloves may react to potential contaminants, so glove selection should be made carefully prior to mobilizing to the field.

7.0 GUIDELINE

7.1. General Considerations

7.1.1. Regulatory Considerations

At most locations, groundwater sampling and the characterization and disposal of purge fluids are specifically regulated by local, or state regulations, or may have client specific requirements. All such client and regulatory requirements must be reviewed before groundwater sampling. At a minimum, the following actions must be taken:

Ensure that groundwater sampling is performed by an entity that meets all requirements for conducting such operations in that particular location; and

Ensure that all follow up well reports required by appropriate agencies are submitted to the appropriate authorities or in some cases that we have informed the client of such requirements.

7.1.2. Decontamination

All non-dedicated sampling equipment that may contact the sample must be decontaminated before and after each use. Non-dedicated pumps or bailers require decontamination of internal and external parts prior to being lowered into the well. Non-dedicated equipment shall typically first be washed with clean tap water (whose chemistry is known and acceptable), non-phosphate detergent (e.g., Alconox), and rinsed with clean tap water. For inorganic analytes 1% nitric acid solution shall be used for a second rinse. For organic analytes, reagent-grade isopropyl alcohol is often used for the second rinse. A final rinse with HPLC/distilled/deionized/Type II water shall complete the decontamination. At a minimum, all acid and isopropyl alcohol wash solutions must be captured (see Section 7.4.2).





7.1.3. Sample Quantities, Types, and Documentation

Samples shall be collected in quantities and types as directed by the Project Manager or as specified in the project work documents. The Field Report Form (Exhibit D) or field notebook and the Sample Integrity Data Sheet (Exhibit E) shall be used to document daily site activities and sample collection (see Section 7.5). Samples shall be transferred to the analytical laboratory under formal chain of custody, which shall be documented (Exhibit C) and maintained in accordance with guideline TG-1.2-23, "Chain of Custody".

7.1.4. Sample Containers

Table 1 provides a summary of the typical type and minimum size of the sample bottles, preservation, storage/handling requirements, and maximum holding times for some common chemical analyses performed on groundwater samples for environmental investigations. All sample bottles must be properly cleaned and prepared by a certified laboratory. All groundwater samples shall be labeled and typically sealed (see Section 7.5) and immediately placed in coolers that have been pre-cooled to 4°C or less and that have securely closed lids for storage and transport. Samples must be received by the analytical laboratory in sufficient time to conduct the requested analyses within the specified holding time. All samples should be placed on ice and stored at 4°C immediately following sampling unless otherwise indicated in the site-specific work plan.

7.1.5. Acceptable Materials

The choice of materials used in the construction of sampling devices should be based upon knowledge of what analytes may be present in the sampling environment and how the sample material may interact.

Typically acceptable materials that may contact groundwater sample are stainless steel and fluorocarbon resin (Teflon, PTFE, FEP, or PFA). Glass is an acceptable material for contacting some samples. Plastics (PVC, polyethylene, polypropylene, tygon) are an acceptable material for contacting some samples, often when the analyses are for inorganic analytes (metals, radionuclides, anions, cations).

7.1.6. Sample Acquisition

Groundwater samples shall typically be removed from the well with the use of a permissible pump or bailer. Electric positive-pressure pumps made of acceptable materials as defined in Section 3.0 are permissible to use for acquiring any groundwater sample. Gaseous, typically air or nitrogen pressure activated positive-pressure pumps made of acceptable materials are permissible to use for acquiring any groundwater sample if the gas does not contact the sample. Positive-pressure pumps operated by mechanically forcing water through check valves are often permissible for acquiring any groundwater samples. Bailers made of acceptable materials are permissible for acquiring groundwater samples in some circumstances.

Peristaltic pumps and air-lift pumps are not preferred for acquiring groundwater samples but are often permissible when samples are to be analyzed for analytes that are not affected by aeration, and are not affected by changes in pH or pressure.

Other types of pumps (peristaltic, centrifugal, air lift, recirculation, etc.) may typically be used for purging groundwater from wells prior to sample acquisition, if: (1) pump materials contacting well water are acceptable; (2) pumping does not aerate or change the pH of the remaining well water; and (3) pumped water does not mix with remaining well water during pumping or after the pumping is stopped.



The appropriate pump should be selected by the Project Manager prior to mobilizing to the field.

7.2. Groundwater Sample Acquisition

7.2.1. Floating or Sinking Non-Aqueous Fluids

Groundwater shall be examined for the presence of any floating or sinking non-aqueous fluids, in unknown situations or where they may be potentially present, at the direction of the Project Manager. If detected, they shall be sampled prior to purging any water from the well. An interface probe is often used for this purpose along with measurement of the liquid/water level. Guideline TG-1.4-6, "Water Level Measurement" may be applicable. A bailer (preferably with a check valve at the bottom only and made of transparent Teflon or glass) may be lowered into the well to retrieve a sample of floating non-aqueous fluid. The bailer shall not become completely submerged. A sample of sinking non-aqueous fluid can often be obtained using a stainless steel device designed specifically for discrete interval sampling. If a non-aqueous fluid is sampled, it may be transferred to a 40 ml or 125 ml glass vial with an air-tight, Teflon-lined septum cap. The sample shall not be filtered or preserved with additives, but shall typically be placed in a metal can with vermiculite and then in a cooler that has been pre-cooled to 4°C and secured for storage and transport. There are often very stringent requirements for transport of such samples.

7.2.2. Purging the Well

It is often preferable to conduct well purging using a low flow/low stress methodology. Purging shall be conducted by starting the pump at its lowest setting and slowly increasing the pumping rate until flow occurs (typically flow rates on the order of 0.1 to 0.4 l/min). Ideally at this pumping rate, there should be a minimum level of water level drawdown (generally less than 10 cm). Monitor and record the pumping rate and water level as appropriate during purging. During purging, monitor indicator field parameters (e.g., turbidity, temperature, specific conductance, pH, ORP, DO) every three to five minutes. Purging is considered complete and sampling may begin when the indicator parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken on 3 to 5-minute intervals, are within the following tolerance:

- Turbidity (within 10% and preferably less than 5 NTU);
- Temperature (within 0.5 degrees C):
- Specific conductance (within 10%);
- pH (within 0.1 stnd pH units);
- ORP (within 10%); and
- **DO** (within 10%).

If the low flow/low stress methodology is not used, the pump or bailer shall be used and operated in accordance with the manufacturer's operational manual. Before collecting the actual groundwater sample field parameters of at least pH, redox, temperature, and specific conductivity should come to stabilize or approach asymptotical values. In general this will require that a minimum of three (3) well bore storage volumes of water shall be purged from the well by pumping. Calculate this volume by measuring the depth to water and subtracting this depth from the total depth of the well. If a gravel/sand pack surrounds the screen the pore volume of the gravel/sand pack (assume a porosity of 25 percent if unknown) shall be added to the total well volume. While purging water from the well, parameters specified by the Project Manager will be monitored.



A flow-through cell is advantageous for the monitoring of field indicators. Typically, if the parameters are within the ranges specified above, then the water has stabilized. Rarely are more than ten well volumes removed before sampling using these criteria. If the parameters of interest in the investigation include VOCs, care must be taken to ensure that purging does not induce degassing within the well. Where the well screen and sand pack are completely below the water table, the rate of purging should be controlled such that it does not draw the water level in the well below the top of the well screen. Where the well screen and sandpack are intersected by the groundwater level, the rate of purging should correspond with the rate of sampling, if continuous sampling methods are used. Large drawdowns in water table wells should be avoided. Purged groundwater that has a reasonable potential of containing hazardous substances shall be captured and characterized prior to discharge or disposal (see Section 7.4.1). Where a low yielding well is encountered, the Project Manager shall be contacted for direction (see Section 7.6).

7.2.3. Samples for Major Cation, Metal and Metallic Radionuclide Analyses

Samples for major cations and metallic radionuclide analyses are sometimes filtered immediately or within two hours after acquisition. However, most projects require that samples for cations are not filtered. Filtration is best accomplished with the use of an in-line filter system in which the sample is directly fed from the discharge port of permissible positive-pressure pump through the filter and into the appropriate sample bottle. A less preferred but acceptable method is the collection of an adequate amount of sample from a permissible positive-pressure pump or bailer into a properly cleaned and prepared high-density linear polyethylene or glass prefiltration bottle. The prefiltration bottle does not contain any chemical preservative. Aliquots shall be immediately fed through the filter and collected directly into the appropriate sample bottle. The final filter pore size should typically be 0.45 microns. (Note: New filters made of material specified by the Project Manager shall be used for each sample and the filter system must be decontaminated before and after each sample.) These groundwater samples shall be preserved with nitric acid (HNO3) to a pH less than 2. A new capillary tube can be used to remove fluid from the bottle and dabbed onto pH indicator paper to check that the pH is less than 2.

An unfiltered aliquot of a sample can typically be obtained (in addition to the filtered aliquot) directly from a permissible positive-pressure pump discharge port or from the bailer into appropriate sample bottles (see Table 1) and preserved with nitric acid to a pH less than 2. Note that for various cations, including chromium VI, no acid and typically no other chemical preservative is added to the aliquot.

7.2.4. Samples for Semi-Volatile Organics Including Extractable Base-Neutral/Acid Compounds, Phenolic Compounds, Pesticides, PCBs and Herbicides

Samples for semi-volatile organics including extractable base-neutral/acid compounds, phenolic compounds, PCBs, pesticides, or herbicides analyses shall typically be collected directly from a positive-pressure pump discharge port or bailer in appropriate sample bottles often with a Teflon lined lid and in some cases an appropriate chemical preservative. Sample should not be allowed to overflow the sample bottle and in the vast majority of cases shall not be filtered unless specified in a project-specific work plan.

7.2.5. Samples for Purgeable Volatile Organics

Samples for purgeable volatile organics are obtained before samples for other analytes have been acquired for each well. In wells with low productivity, volatile organics should be the first samples taken, unless otherwise directed by the Project Manager. Samples for purgeable volatile organics shall typically be obtained from the well using a permissible positive-pressure pump or bailer and shall be collected directly from the pump discharge tube or bailer into properly cleaned and prepared 40 ml vial.



TG-1.2-20 samples

Collection of groundwater quality

The sample should not be allowed to overflow the sample bottle as this may remove acid preservative that is usually added at the laboratory either prior to sample shipment to the field or by field staff before filling the vials. The pH of the aliquot should be checked if acid preservative is used and the buffering capacity of the groundwater is high or unknown or more turbid than usual from a carbonate rich strata. A new capillary tube can be used to remove fluid from the bottle and dabbed onto pH indicator paper to check that the pH is less that specified by the methodology for acid preserved samples – often less than pH 2.

Air contact and sample agitation should be minimized. Pumping rates should be significantly reduced during sampling for volatile organics to reduce potential agitation of the sample. These samples shall not be filtered or preserved except as noted below. The bottle should be filled until there is a convex meniscus to facilitate an airtight seal when capped. Immediately after collection, a Teflon lined silicon septum cap shall be placed Teflon side down tightened onto the vial. There should be no air bubbles remaining within the vial once the cap has been fastened; if air is present, a new sample shall be taken by the same guideline.

Samples for many volatile methods are preserved with hydrochloric acid (HCl) to increase holding time. However, in some waters the acid will react with the sample producing bubbles due to production of carbon dioxide or sulfur compounds. If bubbles are found due to reactions with the acid, contact the Project Manager if this eventuality has not been described in the work plan. The Project Manager may require that samples are taken without acid preservative with the resulting shorter holding times. In this case a new unpreserved vial should be used. An unpreserved sample vial can be obtained by pouring the acid out of a preserved vial if no unpreserved vials are available. It is unlikely that the remaining acid will be sufficient to produce bubbles. However, if bubbles are still found one may slowly fill and empty the vial once or more times to remove the remaining acid. Samples that are not preserved should be noted as such on both the bottle labels and the Chain of Custody documents.

7.2.6. Samples for Cyanide Analyses

Samples for cyanide analyses shall be collected directly into appropriate sample bottles from the bailer or the port of a permissible positive-pressure pump. Samples shall not be filtered nor shall they be allowed to overflow the sample bottle. A pre-preserved bottle is typically made available. Otherwise, samples shall be immediately preserved with sodium hydroxide (NaOH) to a pH greater than 12. A new capillary tube can be used to remove fluid from the bottle and dabbed onto pH indicator paper to check that the pH is greater than pH 12.

7.2.7. Samples for Major Anion and Biological Oxygen Demand (BOD) Analyses

Samples for major anions (chloride, fluoride, sulfate, alkalinity, acidity, total silica, bromide) and for biological oxygen demand shall be collected directly into appropriate sample bottles from the port of the pump or from the bailer. These samples do not require filtration, but may be filtered if explicitly required in the sampling plan. Chemical preservatives shall only be added as required by the method.

7.2.8. Samples for Total Phosphate and Orthophosphate Analyses

Groundwater samples for total phosphate and orthophosphate analyses shall typically be immediately filtered after initial sample acquisition. However, these parameters often are specified to be taken without filtration. Filtration is best accomplished with an in-line system in which a positive-pressure pump discharge port feeds groundwater directly through the filter system into an appropriate sample bottle. A less preferred but acceptable method to obtain a filtered sample is to collect a liter of sample from a permissible positive-pressure pump or bailer in a properly cleaned and prepared high-density



TG-1.2-20 samples

Collection of groundwater quality

polyethylene or glass bottle, and then immediately feed the sample through a filter system (e.g., syringe filters) which discharges into the appropriate sample bottle. This process should be completed within two hours; otherwise, the results will be suspect. The final filter pore size shall typically be 0.45 micron. (Note: New filters made of most any material must be used for each sample and the filter system must be decontaminated before and after each use.) Samples shall be immediately placed on ice and preserved by cooling to 4°C or lower.

7.2.9. Samples for Total Phosphorus, Nitrogen Compounds, Chemical Oxygen Demand, Total Organic Carbon, and Total Organic Halogen Analyses

Groundwater samples for total phosphorus, nitrogen compounds, chemical oxygen demand, and total organic carbon analyses shall be collected directly into appropriate sample bottles from a permissible positive pressure pump discharge port or from the bailer. These samples shall not be filtered and shall be chemically preserved as required by the various methods.

7.2.10. Samples for Analysis of Total Dissolved Solids

Groundwater samples for analyses of total dissolved solids shall be immediately filtered in the field by methods discussed in Section 7.2.3 above or collected without filtration depending on sampling plan, and put directly into an appropriate sample bottle. Samples shall not be preserved with chemicals.

7.2.11. Samples for Oil and Grease or Hydrocarbons

Groundwater samples for oil and grease or hydrocarbons shall be collected directly into the appropriate sample container from the discharge port of a permissible positive pressure pump or from the bailer. These samples shall not be filtered and in some cases shall be preserved with hydrochloride acid (HCL, 1 + 1 Vol/Vol) to a pH less than 2. A new capillary tube can be used to remove fluid from the bottle and dabbed onto pH indicator paper to check that the pH is less than 2. Do not preserve with sulfuric acid due to potential interferences in the analytical procedure from co-extraction of elemental sulfur.

7.2.12. Samples for Fuel Fingerprinting

Groundwater sample for fuel fingerprinting shall be collected directly into the appropriate sample container using a permissible positive pressure pump or bailer and shall be collected directly from the pump discharge tube or bailer. Some guidelines require that the sample be allowed to overflow approximately 2 to 3 sample container volumes minimizing agitation and contact with air. These samples shall not be filtered but typically must be preserved to a pH <2 with HCL (1:1 vol/vol). A new capillary tube can be used to remove fluid from the bottle and dabbed onto pH indicator paper to check that the pH is less than 2. The sample container is then often capped with a Teflon lined silicon septum cap excluding all headspace. Otherwise the sample is often split into two or three aliquots for different analyses as dictated in the sampling plan or as specified by the Project Manager.

Field Analyses 7.3.

7.3.1. Calibration of Instruments

All instruments used for field analyses shall be calibrated in accordance with guidelines required by the sampling and analysis plan; or by the most strict single guideline or combination of guidelines compiled from procedure QP-1, "Calibration and Maintenance of Measuring and Test Equipment;" or by the method or manufacturer's procedure. Only equipment with a calibration tag showing a validity date later than the anticipated date of use shall be taken to the field unless, as is usual, field calibration is performed. Each





instrument should be accompanied by a copy of the manufacturer's operation manual and appropriate instrument calibration records.

7.3.2. Water Temperature

A meter and a flow though cell are the preferred tools for measuring this parameter. The meter shall be calibrated in accordance with the sampling plan, and if more stringent, with the manufacturer's procedures (provided with the instrument). If a meter is unavailable, a thermometer shall be used to measure the temperature of the water on an aliquot of purged water obtained just before sampling. The thermometer reading shall be allowed to stabilize and shall be recorded to the nearest 0.5°C. The thermometer shall be rinsed with distilled/deionized water before and after each use.

7.3.3. pH Measurement

A meter and a flow though cell are the preferred tools for measuring this parameter. Alternately, a pH meter may be used to measure the pH of the sample on an aliquot of purged water that was obtained just before sampling. Measurements shall be made immediately on the obtained aliquot. (Note: If possible, measure pH continuously on the purged water in an air-space free and closed flow-through system.) Calibration shall be in accordance with the sampling plan or, if more stringent, with the manufacturer's procedures (provided with the instrument). At a minimum, calibration shall be performed at the beginning and ending of each day's use and every four hours in between. Calibration shall be performed with standardized buffered pH solutions and conducted as required by the more stringent of the sampling plan or manufacturer's specifications. Typically, the probe shall be thoroughly rinsed with distilled/deionized water after each sample when using a flow through cell or after each sample reading when the probe is placed in a discrete aliquot of sample. The pH shall be recorded to one-hundredth, if the meter is stable enough of a pH unit.

7.3.4. Conductivity Measurement

A meter and a flow though cell are the preferred tools for measuring this parameter. Alternately, a conductivity probe may be used for conductivity measurement on an aliquot of purged water obtained just before sampling. Measurements shall be made as soon as possible on the obtained aliquot. The meter shall be calibrated in accordance with sampling plan or, if more stringent with the manufacturer's procedures (provided with the instrument) with standardized calibration solutions. It is preferable to have a range of calibration solutions that bracket the site conductivity range. At a minimum calibration shall be performed at the beginning and ending of each day's use and every four hours in between. The conductivity shall typically be recorded to two significant figures and rarely more than three significant figures. The temperature of the sample at the time of conductivity measurement shall also be recorded. The probe must be thoroughly rinsed with distilled/deionized water before and after each use. It is imperative that the Sampling Technician record the correct units in which the conductivity measurements were taken.

7.3.5. Dissolved Oxygen Measurement

A meter and a flow though cell are the preferred tools for measuring this parameter. Alternately, a dissolved oxygen meter is used to measure dissolved oxygen (DO) in water samples. This test should be at best considered a rough estimation with most meters as the measurements are subject to a number of environmental interferences that may affect the results. Measurements shall be made immediately on aliquots obtained just before sample acquisition. (Note: If possible, measure DO continuously on the purge water in a closed flow-through system.)





The meter shall be calibrated in accordance with the sampling plan or, if more stringent, with the manufacturer's procedures (provided with the instrument). Any salinity adjustment shall be made to the approximate salinity of the water (one may use knowledge of the subsurface or some conductivity meters or dedicated salinity meters to obtain the salinity of the water). The probe must be thoroughly rinsed with distilled/deionized water before and after each use. Measurements shall typically be recorded to the nearest 0.1 ppm concentration.

7.3.6. Turbidity Measurements

A turbidity meter shall typically be used to make turbidity measurements on aliquots of water samples obtained just before sample acquisition. Measurements shall be made as soon as possible on the obtained aliquot. Operation and calibration shall be in accordance with the sampling plan or, if more stringent, with the manufacturer's procedures (provided with the instrument). It is preferable to have a range of calibration solutions that bracket the site turbidity range. At a minimum calibration shall be performed at the beginning and ending of each day's use and every four hours in between. Calibration shall be performed with calibration solution specified for the project. Measurements shall be recorded to the nearest 0.1 NTU when less than 1 NTU; the nearest 1 NTU when between 1 and 10 NTU; and the nearest 10 NTU when between 10 and 100 NTU.

7.3.7. Redox Potential Measurements

A meter and a flow though cell is a preferred way to measure this parameter. Alternately, a redox meter may be used to obtain redox potential measurements. However, there are many other ways to measure redox couples. When a meter is used the reading should be obtained on an aliquot of purged water that was obtained just before sampling. Measurements shall be made immediately on the obtained aliquot. (Note: The best results using a redox meter usually come from measuring the redox on the purged water in an air-space free and closed flow-through system.) Calibration and operation shall be in accordance with the sampling plan and if more stringent with the manufacturer's procedures (provided with the instrument). It is preferable to have a range of calibration solutions that bracket the site redox potential range. At a minimum calibration shall be performed at the beginning and ending of each day's use and every four hours in between. Calibration shall be performed with calibration solution specified for the project. Typically, the probe shall be thoroughly rinsed with distilled/deionized water after each sample when using a flow through cell or after each sample reading when the probe is placed in a discrete aliquot of sample. The redox using a probe shall be recorded in millivolts to the number of significant figures required by the sampling plan - which is typically three significant figures.

7.4. Capture and Disposal of Purge Water and Decontamination Solutions

7.4.1. Purge Water

Purged groundwater shall be handled as specified in the sampling plan. Typically purge water will be captured and contained in 55-gallon steel drums or suitable vessel(s). If required, each drum or tank containing captured purge water shall be properly labeled with a weather proof label as to the contents, the well(s) from which the contained purge water originated and the date in which the contents were generated. Storage of the drums or tanks shall be as specified in the project work documents or as directed by the Project Manager. In many cases there is specific wording required for the labels and this should be found in the sampling plan.

Captured and contained purge water shall be characterized for discharge, treatment and/or disposal. Characterization of the captured and contained purge water should be specified in the sampling plan or other project work documents or by the Project Manager, but could rely on site knowledge, the analytical results of groundwater samples associated with each drum or other vessel, or could involve direct sampling and analyses of the contained water.



The requirements and options available for discharge, treatment and/or disposal are dependent upon many variables such as client requirements, chemical consistency, local and state and other regulations and location of site. Discharge, treatment and/or disposal of captured and contained purge water must be in accordance with all applicable requirements such as, but not limited to, client specific procedures. Local, state and Federal regulations and shall be specified in the sampling plan or in other project work documents.

7.4.2. Decontamination Waste Solutions

Decontamination waste solutions that are generated during groundwater sampling include: spent detergent wash solutions; spent tap water rinses; any spent acid or alkali rinses, any spent organic (such as isopropyl alcohol) rinses; and spent final distilled/deionized water rinses. All decontamination waste solutions shall be captured and contained in appropriately sized vessels as required by the sampling plan or other project documentation. In any cases where this is not clear, the Project Manager shall be contacted so they can determine (with input from others as needed) whether spent decontamination solutions require capture and containment.

Captured and contained decontamination waste solutions shall be subject to requirements of the sampling plan or other project documentation. These are often generally the same guidelines as described for purge water. A noteworthy typical requirement is that all acid and alkali solutions shall be neutralized prior to discharge or disposal.

7.5. Documentation

Documentation for sampling groundwater includes labeling sample bottles; and other requirements as specified by the sampling plan or other project documentation. These further requirements often include project field notebooks, Sample Integrity Data Sheets, Field Report Forms, and Chain of Custody Records; additional documentation requirements may warrant securing individual samples or sample coolers with chain of custody seals.

7.5.1. Sample Labels

Samples shall be immediately labeled (see Exhibit A for an example label). Labels shall be water proof. Information shall be recorded on each label with indelible ink. All blanks shall be filled in (N/A if not applicable). Groundwater sample designations will be as specified in the project work documents or by the Project Manager. At a minimum the following information is required upon the label: Site name, sample ID, parameter(s) to be tested, sample date and time, sampler's initials, chemical preservative, if used.

7.5.2. Groundwater Sample Collection Forms

Groundwater Sample Collection Forms (Exhibit B) are used by the Sampling Technician to document the official raw field information for each sample that will be chemically analyzed. All blanks shall be filled in (N/A if not applicable). The original must be submitted as soon as possible to the Project Manager. Copies must be sent to the Task Leader (if appropriate).

7.5.3. Chain of Custody Records

Chain-of-Custody Records (Exhibit C) will be used to record the custody and transfer of samples in accordance with guideline TG-1.2-23, "Chain of Custody." These forms shall be filled in completely (N/A if not applicable). Tamper-proof Seals (Exhibit A) shall be placed on either sample bottles or shipping coolers. The seal number shall be recorded on the Chain of Custody Form. The original form must accompany the samples to the analytical laboratory to be completed and returned to Golder in the



analytical data report. A copy of the Chain of Custody Record documenting the transfer of samples from the field must be submitted to the Project Manager.

7.5.4. Field Report Forms

Field Report Forms (Exhibit D) or project field notebooks shall be used by the Sampling Technician to record daily activities. Data shall be recorded on the Field Report Form in chronological format. The time of each recorded event shall be included. The original Field Report Form must be submitted as soon as possible to the Project Manager. Copies must be given to the Task Leader.

7.5.5. Sample Integrity Data Sheet

Sample Interity Data Sheets (Exhibit E) shall be used by the Sampling Technician to record raw field information for each sample that will be chemically analyzed. This data sheet can be used as a supplement to but not in lieu of a groundwater sample collection form. The original must be submitted as soon as possible to the Project Manager. Copies must be given to the Task Leader.

7.6. Field Change Request

Variation from established guideline requirements may be necessary due to unique circumstances encountered on individual projects. All variations from established guidelines shall be documented on Field Change Request (Exhibit F) and reviewed by the Project Manager.

In lieu of requirements in the sampling plan or other project documentation, the Project Manager may authorize individual staff to initiate variations as necessary. If practical, the request for variation must be reviewed by the Project Manager or their designee prior to implementation. All completed Field Change Requests will be maintained in project records.

8.0 REFERENCED GUIDELINES

Golder Associates Inc. Quality Procedure QP-1, "Calibration and Maintenance of Measuring and Test Equipment."

Golder Associates Inc. Technical Guideline TG-1.2-23, "Chain of Custody."

Golder Associates Inc. Technical Guideline TG-1.4-6, "Water Level Measurement."

9.0 ADDITIONAL GUIDELINES AND PROCEDURES

Wood, W.W. (1976), "Guidelines for Collection and Field Analysis of Ground-Water Samples for Selected Unstable Constituents," Techniques of Water-Resources Investigations of the United States Geological Survey, Book 1, Collection of Water Data by Direct Measurement, Chapter D2.

U.S. EPA, 1986, Test Methods for Evaluating Solid Waste - (SW-846), 3rd Edition (Final Update III, December 1996), U.S. EPA/Office of Solid Waste, Washington, D.C.

40 CFR 136, U.S. EPA, Guidelines Establishing Test Procedures for the Analysis of Pollutants. Title 40 Part 136 of the Code of Federal Regulations.

U.S. EPA, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, U.S. EPA/Office of Solid Waste, Washington D.C.





40 CFR 141, U.S. EPA, National Primary Drinking Water Regulations, Title 40, Part 141 of the Code of Federal Regulations.

Various EPA Region and State Standard Operating Procedures

Golder Associates Technical Guideline TG-2.3-3, "Headspace Analysis Using the Organic Vapor Analyzer"





Collection of groundwater quality



TABLE 1



TABLE 1

SAMPLE CONTAINER CODES, TYPES, VOLUMES, PREPARATION, SPECIAL HANDLING, PRESERVATION, HOLDING TIMES
Page 1 of 2

Analysis	Cont. Code	Containers, Water	Handling and Preservation	Holding Time
Volatile Organics	v	2, 40ml glass vial teflon lined septum	Store 4±2°C; handle upwind from euip. Fumes, no headspace permitted; Pres with HCl to pH <2 for volatile aromatics	7 days 14 days (HCl pres.)
Base/Neutral and Acid Extractable Organics	sv	2, 1 liter amber glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes; no contact with plastics, gloves	7 days until extraction 40 days thereafter
Organiochlroine Pesticides and PCBs	P	2, 1 liter amber glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes; no contact with plastics, gloves	7 days until extraction 40 days thereafter
Herbicides	Н	2, 1 liter amber glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes; no contact with plastic, gloves	7 days until extraction 40 days thereafter
Total Fuel Hydrocarbons (Fuel Fingerprint)	TH	1, 125 ml amber glass, teflon lined septum	Store 4±2°C; handle upwind from equip. fumes, no headspace permitted; pres with HCl to pH <2	14 days
Total Petroleum Hydrocarbons or Oil and Grease	OG	1, 1 liter glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes, no contact with gloves or plastics; pres with HCl to pH <2	28 days
Cyanide (total)	CN	1,1 liter plastic	Store 4±2°C; pres with NaOH to pH >12	14 days
Suflide (total)	S	1, 1 liter plastic	Store 4±2°C; pres with ZnOAC/NaOH to pH >12	7 days
Chloride, Sulfate, pH Conductivity and Total Dissolved Solids	МА	1,1 liter plastic	Store 4±2°C.	28 days (Chloride, sulfate and conductivity) Analyze on-site (pH) 7 days (TDS)

TABLE 1

SAMPLE CONTAINER CODES, TYPES, VOLUMES, PREPARATION, SPECIAL HANDLING, PRESERVATION, HOLDING TIMES, Page 2 of 2

Analysis	Cont. Code	Containers, Water	Handling and Preservation	Holding Time
Major Cations and Metals (Except Mercury)	TM	1,1 liter plastic	0.45 um filter, pres with HNO ₃	6 months
Mercuryy	•		to pH <2	
Mercury	HG	1,500 ml plastic	0.45 um filter, pres with HNO ₃	28 days
			to pH <2	in the second se
Gamma Emitting Radionuclides	GR	2, 1 liter plastic	0.45 um filter, pres with HNO₃	6 months
			to pH <2	(record exact date/time of sampling for calculation of half-life decay)
Alpha Emitting Radionuclides	AR	2, 1 liter plastic	0.45 um filter, pres with HNO ₃	6 months
			to pH <2	(record exact date/time of sampling for calculation of half-life decay)
Beta Emitting Radionuclides	BR	2, 1 liter plastic	0.45 um filter, pres with HNO ₃	6 months
			to pH <2	(record exact date/time of sampling for calculation of half-life decay)
Total Phosphorus, Ammonia-N,	TP	1, 1 liter plastic	Store 4±2°C; pres with H ₂ SO ₄	28 days
Nitrate/nitrite-N, COD and TOC			to pH <2, store in dark	
Orthophosphate	OP	1, 1 liter plastic	0.45 um filter, store 4±2°C	48 hours



Collection of groundwater quality



EXHIBIT A



Golder
Location Date Date Date Boring No Sample No Depth Blows Description
Driller Engr.

Sample Label

Golder Associates Seal Number 2455



Sent By:

Date: _____

Tamper Proof Seal



Collection of groundwater quality



EXHIBIT B



WATER SAMPLE FIELD INFORMATION FORM

Site:								
Location:								
Project Nu	mber:						f older	•
Sampling 7	Team:					VAS	socia	tes
Sample P	oint ID:			(we	II)			
-					•	vice: Teflon Ba i	ler & Nylon F	Rope
Depth to w	ater befo	re purging (ft-b	omp)		Date:	Time	:	
Sounded w	ell depth	(ft-bmp)			PID rea	ading (ppm)		
As-built we	ell depth (ft-bmp)				Casing Vol	ume Calculation	า
Casing dia	meter (in))			2	." 4"	6"	8"
Casing vol	ume (gal)	1			0.163	gal/ft 0.653 gal/f	t 1.47 gal/ft	2.61 gal/ft
Volume pu	rged (gal)		Time	e Start:		Time Finish:	
Depth to w	ater after	purging (ft-bm	np)	Pur	ge Calc:		-	
Remarks:								
WELL INS	PECTION	<u>1</u>		(Circle	Y or N)			
Is well loca	ition corre	ect on map?	Y or N		Is the	well locked?		Y or N
Is well loca		•	Y or N		Is the	lock in good cond	lition?	Y or N
Is well read	dily acces	sible?	Y or N		Is the	well vented?		Y or N
Is well legil	-		Y or N		Does	casing have weep	hole?	Y or N
Is well prot			Y or N			well have dedicat		Y or N
Is casing fr			Y or N			well have dedicat		Y or N
Is protectiv	e casing	secure?	Y or N		Is equ	ip. in good condit	ion?	Y or N
Remarks:								
		FIELD N	<u>MEASUREM</u>	<u>ENTS</u>		<u>Units</u>	Calibrat	tion Notes
Time	1)	2)	3)	4)	5)			
Temp.	1)	2)	3)	4)	5)	<u>•С</u>	Calibration	time:
рН	1)	2)	3)	4)	5)	std. units	Serial#:	
Sp. Cond	1)	2)	3)	4)	5)	mS/cm		
Turbidity	1)	2)	3)	4)	5)	ntu		
D.O.	1)	2)	3)	4)	5)	mg/l		
Redox	1)	2)	3)	4)	5)	<u>mV</u>		
DTW	1)	2)	3)	4)	5)	ft-bmp		
Volume	1)	2)	3)	4)	5)	gallons		
Sample Co	llection N	lotes:						
Weather co	onditions	at time of sam	pling:					
Sample ch	aracterist	ics:						
Sample da	te / time:			Met	hod of sample	collection: Tefle	on Bailer & N	ylon Rope
Analytical I	Paramete	rs:						
Signature:				Come	nany: Goldor	Associates Inc.	Data	
Signature.	n #03027				barry. Golder	naauulalea IIIU.	_ Dale.	

LOW FLOW GROUNDWATER PURGE/SAMPLE FIELD INFORMATION FORM

Site										Golder Associates
Location:										Associates
Project N					Meter/Type/Seri	al #:				
MONITOR					Meter Calibrated	d @:				
Depth to	Depth to Water Prior to Purging [ft-bmp]:				Sampling Date/7	Γime:				
Well Casi	ng Diameter [i	n]:				Sampler(s):				
Start Time	e (purging):					Sampling Device	e :			
Purging D	Device:					Sampling Purge	Rate:			
Pump inta	ake setting:					Sample Charact	eristics:			
Well Scre	en Interval:					PID Measureme	ent of Well	Headspac	e (ppm):	
As-Built C	Construction W	ell Depth	າ [ft-bmp]:			Analytical Paran	neters:			
Sounded	Well Depth [ft-	bmp]:								
Weather	Conditions:		T			Fe+2 result (field				PM
Time	Temperature	рН	Specific Conductance	Turbidity	Dissolved Oxygen	Redox Potential	Depth To Water	Volume Purged	Approximate Purge Rate	Observations (PID readings, sample characteristics,
		•	Circle One		75	Note - Indicate		J	3	equipment problems, etc.)
[hh:mm]	[°C]	[std]	[S/m] or [mS/cm]	[ntu]	[mg/l]	<u>if (+) or (-)</u> [mV]	[ft-bmp]	[liters]	[ml/min]	
[[0]	լուսյ	[c/m] or [mo/om]	[IIIG]	[9/.]	[•]	[it-bilip]	[IIICI3]	[1111/11111]	
Comment	<u>s:</u>		,							
									Signature:	







EXHIBIT C



CHAIN OF CUSTODY RECORD PROJ. NO. SITE/LOCATION NO. SAMPLERS: (Signeture) OF REMARKS (with initials) CON. MEDIA TAINERS STA. NO. DATE TIME SAMPLE IDENTIFICATION Relinquished by: (Signotore/Firm) Date / Time | Received by: (Signature / Firm) Relinquished by : (Signature/Firm) Date / Time Received by: (Signature/Firm) Relinquished by: (Signature/Firm) Date/Time Received by : (Signature / Firm) Relinquished by: (Signature/Firm) Date / Time Received by: (Signature/Firm) Relinquished by: (Signature/Firm) Date/Time Received by: (Signature/Firm) Date / Time Remarks (attachments if necessary)



Collection of groundwater quality



EXHIBIT D



	GOLDER ASSOCIATES	DATE	108 MO
		PRUJECT	
		LOCATION	
		CONTRACTOR	OWNER
	то	WEATHER	YEMP *at AN
		PRESENT AT BITE	•at PM
	THE FOLLOWING WAS NOTED.		
	,		
4 .	•		
		· · · · · · · · · · · · · · · · · · ·	
•			
			+
-			
	COPIES TO		ID RIEIPORT

.



Collection of groundwater quality



EXHIBIT E



SAMPLE INTEGRITY DATA SHEET

Plant/SiteSite Location		o
	Sample IL)
	(s)	
Type of Sampler		
Date	Time	
Media	Station	
Sample Type: grab	time composite	space composite
Sample Acquisition Measuremen	nts (depth, volume of static well w	vater and purged water, etc.)
Sample Description		
Field Measurements on Sample	(pH, conductivity, etc.)	
Aliquot Amount	Container	Preservation/Amount
Sampler (signature)		
Supervisor (signature)	Date	

Golder Associates Inc.



Collection of groundwater quality



EXHIBIT F



FIELD CHANGE REQUEST	Golder
Job/Task Number: Procedure Reference: Other Affected Documents:	
Requested Change:	
Reason for Change:	
Change Requested by:	Date
Reviewed by: Project Manager	Date
Comments:	

Golder Associates Inc.

TG-1.2-23 Chain of Custody

TECHNICAL GUIDELINE FOR CHAIN OF CUSTODY TG-1.2-23 Rev. #2 8/20/2009



TG-1.2-23 Chain of Custody

Table of Contents

1.0	PURPOSE	1
2.0	APPLICABILITY	1
3.0	DEFINITIONS	1
3.1.	Custody	1
3.2.	Chain of Custody	1
4.0	DISCUSSION	1
5.0	RESPONSIBILITIES	1
5.1.	Project Manager	1
5.2.	Geologist/Field Engineer	2
5.3.	Sampler	2
5.4.	Laboratory Sample Custodian	2
5.5.	Document Custodian	2
6.0	EQUIPMENT AND MATERIALS	2
7.0	GUIDELINE	3
7.1.	Seals, Labels, and Initial Storage	3
7.2.	Sample Packaging	3
7.3.	Sample Examination	3
7.4.	Chain of Custody Form Initiation	4
7.5.	Transfer of Custody	4
7.6.	Receipt at Destination	4
7.7.	Document Tracking	5
7.8.	Field Change Request	5
8.0	REFERENCED GUIDELINES	5
9.0	ADDITIONAL GUIDELINES AND PROCEDURES	5

List of Exhibits

Exhibit A Seals and Labels

Exhibit B Sample Integrity Data Sheet
Exhibit C Chain of Custody Form
Exhibit D Field Change Request Form

List of Figures

Figure 8-1 Sample Container Packing Arrangement





TG-1.2-23 Chain of Custody

1.0 PURPOSE

This technical guideline establishes the requirements for documenting and maintaining environmental sample chain of custody from point of origin to receipt of the sample at the analytical laboratory.

2.0 APPLICABILITY

When specifically invoked by project work plans, sampling plans, or QA plans, this technical guideline shall apply to all types of air, soil, water, sediment, biological, and/or core samples to be analytically tested in support of environmental investigations by Golder Associates Inc., and is applicable from the time of sample acquisition until custody of the sample is transferred to an analytical laboratory.

3.0 DEFINITIONS

3.1. Custody

Custody refers to the physical responsibility for sample integrity, handling, and/or transportation. Custody responsibilities are effectively met if the samples are:

- in the responsible individual's physical possession;
- in the responsible individual's visual range after having taken possession;
- secured by the responsible individual so that no tampering can occur; or
- secured or locked by the responsible individual in an area in which access is restricted to authorized personnel.

3.2. Chain of Custody

Chain of custody refers to the history of the physical transfer of samples between the sampler, the transporter, or carrier, and the laboratory technician. Chain of custody documentation is required as evidence that the integrity of samples was maintained during transfer.

4.0 DISCUSSION

Environmental samples must be tracked, handled and transported in a manner such that sample integrity and identification (to the location and interval at which they were obtained) is maintained. The sample custodian must maintain proper storage and custody of samples from the time of collection until transport to the laboratory. The sampler shall initiate Chain of Custody forms which accompany samples from the collection site to the laboratory and provide documentation of any transfer of custody throughout transport. Sample identification and integrity shall be ensured by the application of seals and labels to the sample containers at the time of sample collection. Seals and labels shall be verified upon receipt of samples at the analytical laboratory; unacceptable samples shall be identified on the Chain of Custody form, and referred to the Geologist/Field Engineer or Project Manager for evaluation and appropriate disposition.

5.0 RESPONSIBILITIES

5.1. Project Manager

The Project Manager is responsible for the overall management of environmental sampling activities, for designating the sample shipment method (considering permitted sample holding times), for delegating





sampling responsibilities to qualified personnel, and reviewing any Field Change Requests that may be initiated during the investigation.

5.2. Geologist/Field Engineer

The Geologist/Field Engineer is responsible for: 1) providing general supervision of sampling operations as directed by the Project Manager; 2) ensuring proper temporary storage of samples and proper transportation of samples from the sampling site to the laboratory; and 3) initiating Field Change Requests when required. The Geologist/Field Engineer is also responsible for tracking Chain of Custody forms for samples to ensure timely receipt of the completed original, for reviewing Chain of Custody forms to ensure appropriate documentation of sample transfers, and for advising the Project Manager of any problems observed that are related to sample integrity and chain of custody. The Geologist/Field Engineer may delegate document tracking and review responsibilities to suitably qualified personnel.

5.3. Sampler

The sampler may be the same individual as the Geologist/Field Engineer and is responsible for: 1) sample acquisition in compliance with applicable guidelines and procedures; 2) checking sample integrity and documentation prior to transfer; 3) initiating the Chain of Custody form; 4) maintaining custody of the samples while completing the sampling project; and 5) physically transferring the samples to the transporter or directly to the laboratory.

5.4. Laboratory Sample Custodian

The laboratory sample custodian or designated sample receiving technician is responsible for: 1) inspecting transferred samples to ensure that seals are intact, that labels are affixed, that sample condition is acceptable, and that Sample Integrity Data Sheets are completed, when required for a particular project; 2) completing the Chain of Custody form upon receipt; 3) forwarding copies of the completed Chain of Custody form to the Project Manager; and 4) segregating and identifying unacceptable samples, and subsequently notifying the Golder Project Manager.

5.5. Document Custodian

The document custodian (project manager or administrative assistant) is responsible for maintaining completed Chain of Custody forms in the project files.

6.0 EQUIPMENT AND MATERIALS

- Seals and labels (Exhibit A)
- Sample Integrity Data Sheets (Exhibit B), if required by the applicable sampling procedure, work plan, sampling plan, or quality assurance (QA) plan, or if requested by the Project Manager
- Chain of Custody forms (Exhibit C)
- Field Change Request form (Exhibit D)
- Packing and shipping materials, which may include coolers or insulated packing boxes, ice, "blue ice" or dry ice, cardboard packing boxes, wooden core storage boxes, and shipping labels. If dry ice is used, caution should be used so that samples do not freeze resulting in broken jars and negative impact to other samples in the same carrier.





7.0 GUIDELINE

7.1. Seals, Labels, and Initial Storage

At the time of collection, all samples shall be sealed, labeled, and appropriately stored in the custody of the sample custodian as defined in 3.1 above. Examples of standard seals and labels are included in Exhibit A.

7.2. Sample Packaging

All samples shall be packaged appropriately for shipping to protect them from damage, to ensure that moisture content is maintained where necessary, and to ensure that appropriate temperatures are maintained as required. All sample shipping containers shall be sealed (see Exhibit A) to prevent tampering.

Environmental core sample boxing, marking, and labeling shall be in compliance with TG-1.2-2, "Geotechnical Rock Core Logging." Other types of environmental samples stored in jars or bottles may be packaged in insulated coolers, or, if sample temperature is not a concern, in the original sample container packing boxes. Where cooling is required, samples shall be shipped in insulated coolers containing bagged or pre-packaged ice sufficient to keep the samples at $4^{\circ}C \pm 2^{\circ}$. All samples should be carefully placed in the appropriate container(s) and packaged with paper or bubble-wrap to prevent significant movement or breakage during transport.

Samples from boreholes shall be packaged, where appropriate, by placing the jars in shipping containers from the top right corner downward, and from left to right, beginning with the first sample taken as shown in Figure 8-1. An alternative packaging order may be appropriate to isolate contaminated samples to minimize the risk for cross-contamination.

A label containing the following information should be affixed to the front of each shipping container containing environmental samples:

- Project Number
- Location
- Borehole number(s) (if appropriate)
- Date collected
- Sample numbers enclosed

Boxes should be numbered consecutively; the last box from a borehole or drillhole shall also be identified "EOH," (i.e., end of hole).

7.3. Sample Examination

Prior to transfer of samples, the sampler shall ensure that:

- labels and seals are affixed and completely filled out;
- Chain of Custody documentation corresponds to the samples in the shipment;
- special handling and storage requirements are identified where required;
- Sample Integrity Data Sheets are available where required by applicable sampling guidelines or the Project Manager;





- there are no indications of sample container leaks or other questionable conditions that may affect the integrity of the sample; and
- hazardous and/or radioactive samples are clearly identified as such.

Samples that do not meet the requirements for initial transfer shall be referred to the Geologist/Field Engineer or Project Manager for disposition.

7.4. Chain of Custody Form Initiation

The sampler shall initiate the Chain of Custody form (Exhibit C) for the initial transfer of samples. Chain of Custody forms supplied by the analytical laboratory may be used in lieu of the form shown in Exhibit C. At a minimum, the following information shall be entered on the form:

- the destination of the samples and the transporter or carrier;
- the project identification and sampling site;
- the date and time of sample collection;
- the sample identification numbers and descriptions (e.g., media, container);
- analysis required for samples included in the shipment; and
- QA and reporting instructions for the laboratory.

When all required information has been entered the sampler shall sign and date the Chain of Custody form as the initiator.

7.5. Transfer of Custody

To document the initial transfer of samples, the sampler relinquishing custody and the transporter accepting custody shall sign, date, and note the time of transfer on the Chain of Custody form. If the transporter is not an employee of Golder Associates Inc., the sampler may identify the carrier and reference the bill of lading number in lieu of the transporter's signature. The Chain of Custody form should be in triplicate. One copy of the Chain of Custody form shall be forwarded to the Geologist/Field Engineer by the sampler. The original form and the remaining copy shall accompany the samples.

7.6. Receipt at Destination

The laboratory sample custodian shall inspect the transferred samples to ensure that:

- the seals are intact;
- the labels are affixed and legible;
- Sample Integrity Data Sheets are available where required;
- the physical condition of the samples is acceptable; and
- the samples being transferred directly correspond to those listed on the Chain of Custody form.

If the integrity of the samples is questionable, the laboratory technician shall notify the Golder Project Manager, segregate the unacceptable samples and identify them on the Chain of Custody Form. Otherwise, the laboratory sample custodian and the transporter shall sign, date, and note the time of transfer on the Chain of Custody form. If the transporter is not an employee of Golder Associates Inc., the laboratory sample custodian may identify the carrier and reference the bill of lading number in lieu of





the transporter's signature. The laboratory sample custodian shall retain the remaining copy of the Chain of Custody form and forward the original signed copy to the Geologist/Field Engineer. Appropriate laboratory custody procedures shall be initiated upon completion of transfer of custody in compliance with the laboratory's internal QA program requirements.

7.7. Document Tracking

The copy of the Chain of Custody form recording the initial transfer of samples shall be forwarded to the Geologist/Field Engineer, followed by the completed original. The Geologist/Field Engineer shall track the Chain of Custody form to ensure timely completion and receipt of the original, based on the laboratory acknowledgement due date indicated on the form and/or subcontractor agreement.

After receipt of the completed original, the Geologist/Field Engineer may discard the copy. The completed original Chain of Custody form shall be placed in the project files. Chain of Custody forms determined to be overdue or incorrectly completed shall be referred to the Project Manager for appropriate action.

7.8. Field Change Request

Variation from established guideline requirements may be necessary due to unique circumstances encountered on individual projects. All variations from established guidelines shall be documented on a Field Change Request form (Exhibit D) and reviewed by the Project Manager.

The Project Manager may authorize individual Geologist/Field Engineers to initiate necessary variations. If possible, the request for variation shall be reviewed by the Project Manager prior to implementation. If prior review is not possible, the variation may be implemented immediately at the direction of the Geologist/Field Engineer, provided that the Project Manager is notified of the variation within 24 hours of the implementation, and the Field Change Request is forwarded to the Project Manager within 2 working days of implementation. If the variation is unacceptable to either reviewer, the activity shall be redone or action shall be taken as indicated in the comments section of the reviewed Field Change Request. All completed Field Change Requests shall be maintained in project records.

8.0 REFERENCED GUIDELINES

Golder Associates Technical Guideline TG-1.2-2, "Geotechnical Rock Core Logging."

9.0 ADDITIONAL GUIDELINES AND PROCEDURES

EPA, 2002, "Standard Operating Procedure for Chain of Custody of Samples," EPA Region 1 Office of Environmental Measurement and Evaluation, North Chelmsford, Massachusetts.

American Society for Testing and Materials, 2004. Standard Guide for Sampling Chain-of-Custody Procedures, ASTM D-4840-99(2004).





Figure 8-1



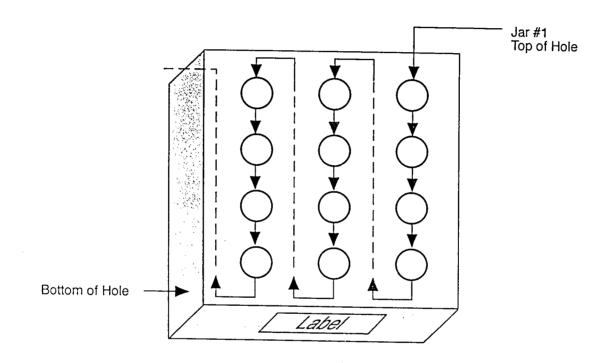


FIGURE 8-1 SAMPLE CONTAINER PACKING ARRANGEMENT TP-1.2-23



EXHIBIT A





Boring No. — Depth	Date Sample No Blows
Driller	Engr



Sample I.D. No.

Date Time
Station Depth
Media
Preservative
Sampled by

Golder Associates	Sent By:
Seal Number	Date:
2455	Golder Associates

SEALS AND LABELS
TP-1.2-23



EXHIBIT B



SAMPLE INTEGRITY DATA SHEET

Plant/Site		No
Site Location		ID
Sampling Location		
Technical Procedure Refere	nce(s)	
Type of Sampler		
Date	Time	
Media	Station	
Sample Type: grab	time composite	space composite
Sample Acquisition Measurem	ents (depth, volume of static well	water and purged water, etc.)
Sample Description		
Field Measurements on Sample	e(pH, conductivity, etc.)	
Aliquot Amount		
	Container	Preservation/Amount
		
Sampler (signature)	Date	
Superviser (signature) ——	Date	



Sample Integrity
Data Sheet
TP-1.2-23



EXHIBIT C



REMARKS (with initials) Received by: (Signature/Firm) Received by: (Signature/Firm) (M TO N C TOATM JA32 Remarks (attachments if necessary) Date/Time Date/Time ON THES Relinquished by: (Signature/Firm) Relinquished by: (Signature/Firm) CHAIN OF CUSTODY RECORD Date/Time PRESERVATIVE Received by: (Signature/Firm) Received by: (Signature/Firm) Received by: (Signature/Firm) SAMPLE IDENTIFICATION Date/Time Date/Time MEDIA SAMPLE TYPE SITE/LOCATION Relinquished by: (Signature/Firm) Relinquished by: (Signature/Firm) Relinquished by: (Signature/Firm) TIME SAMPLERS: (Signature) DATE PROJ. NO. STA. NO.

CHAIN OF CUSTODY FORM TP-1.2-23



EXHIBIT D



FIELD CHANGE REQUEST	Golder
Job/Task Number:Other Affected Documents:Requested Change:	
Reason for Change:	
Change Requested by:	
Reviewed by:GAI Project Manager Comments:	Date
Reviewed by: GAI QA Manager Comments:	Date

Golder Associates Inc.

FIELD CHANGE REQUEST FORM
TP-1.2-23



TECHNICAL GUIDELINE FOR MANUAL GROUNDWATER LEVEL MEASUREMENT TG-1.4-6a

Rev. #5 8/21/2009





Table of Contents

1.0	PURPOSE	. 1
2.0	APPLICABILITY	. 1
3.0	DEFINITIONS	. 1
3.1.	Electric Water Level Sounder	. 1
3.2.	Well or Borehole	. 1
3.3.	Measuring Point (MP)	. 1
3.4.	Diptube	. 2
3.5.	Pressure Transducer	. 2
3.6.	Datalogger	. 2
3.7.	Wetted Tape	. 2
4.0	DISCUSSION	. 2
4.1.	Accuracy, Precision and Repeatability	. 2
4.2.	Measurements in Pumping Wells	. 2
4.3.	Potential Sources of Error	. 2
4.4.	Care of the Equipment	. 3
5.0	RESPONSIBILITY	. 3
5.1.	Field Engineer/Geologist/Hydrogeologist/Technician	. 3
5.2.	Task Leader	. 3
5.3.	Equipment Manager (Where Applicable)	. 4
6.0	EQUIPMENT AND MATERIAL	. 4
7.0	GUIDELINE	. 4
8.0	REFERENCED GUIDELINES	. 5
9.0	ADDITIONAL GUIDELINES AND PROCEDURES	. 5

List of Exhibits

Exhibit A Record of Water Level Readings



1.0 PURPOSE

This technical guideline is to be used to establish a uniform procedure for measuring groundwater levels in borings, drill holes, monitoring wells, and piezometers, by manual methods using an electric water-level sounder.

An alternate technical guideline (TG-1.4-6b, "Automated Groundwater Level Measurement") is to be used in conjunction with this guideline when making automatic water-level measurements using a pressure transducer and datalogger system.

2.0 APPLICABILITY

This technical guideline is applicable to all personnel measuring water levels in wells manually using a calibrated electric water-level sounder. It is not applicable to the measurement of water levels in flowing (Artesian) wells, unless sufficient additional casing is added to prevent the flowing conditions.

This guideline is not applicable for the measurement of water levels by other methods, such as wetted tape, air line, or pressure transducer.

3.0 DEFINITIONS

3.1. Electric Water Level Sounder

An instrument for manually measuring water levels in wells or boreholes. Electric water-level sounders are available in a variety of different types, but each works in essentially the same way, and consists of an open circuit involving a battery, ammeter, bulb, and/or audible beeper mounted within a reel of insulated two-wire electric cable. At the end of the two-wire cable is a weighted metal probe containing a partly-shielded electrode. The cable is graduated or marked to indicate the length of cable above the tip of the electrode in the probe. The circuit is closed when the exposed electrode in the probe is immersed in water. Current flow through the closed circuit is registered on the meter by illumination of the bulb and/or sounding of the beeper on the reel. This indicates that the probe has contacted water. Some sounders may have a sensitivity adjustment.

3.2. Well or Borehole

For the purpose of this guideline, any hole in the ground (cased or open) that may contain groundwater, e.g., a boring, borehole, drill hole, test pit, water well, monitoring well, observation well, pumping well, or standpipe piezometer.

3.3. Measuring Point (MP)

A reference or datum established to provide a consistent point from which the water level is measured, usually a mark on the casing at the top of a well or borehole. The elevation of the measuring point should be established by surveying (differential leveling) from a bench mark of known elevation above the local or national vertical datum. The elevation of the measuring point should be established to an accuracy of 0.01 ft or better. Use of the ground surface as a measuring point is acceptable for measuring water levels in wells and boreholes during drilling, and in other situations (e.g., test pits) where no other stable reference point is available. The measuring point should be clearly described in the field notes so that measurements to the same reference point can be reproduced, if necessary.





3.4. Diptube

A small-diameter (1- to 2-inch) tube (usually PVC) with slots over the lower 1 or 2 feet that is placed in a pumping well to provide a stilling effect that counteracts turbulence.

3.5. Pressure Transducer

A piece of electronic equipment used for measuring pressure (see TG-1.4-6b).

3.6. Datalogger

An electronic unit designed to collect and store data from a pressure transducer (see TG-1.4-6b).

3.7. Wetted Tape

Use of chalk on a measuring tape to sound the depth of water in a well. (This method is no longer in common use.)

4.0 DISCUSSION

4.1. Accuracy, Precision and Repeatability

The prime objectives in measuring a groundwater level are to obtain the depth to groundwater below a measuring point of known elevation, at a specific time, and in a manner that is both precise, accurate and repeatable (if the water level is static). Measurement precision of 0.01 ft is achievable with the fully graduated tapes available on modern electric water-level sounders. However, practical difficulties of calibrating long sounder tapes (e.g., >500 feet), and their sensitivity to stretching, reduce the accuracy of readings to, at best, 0.05 ft. This is usually adequate for most practical purposes. However, if a fixed measuring point is not available and the measurement is made in relation to the ground surface, this degree of accuracy and precision is not practical. Measurements made to ground surface should be recorded to the nearest 0.5 or 1.0 foot, and noted in the water-level record.

4.2. Measurements in Pumping Wells

Turbulence caused by pumping can make measurements of dynamic water levels difficult in wells that are being pumped. In this situation, a small-diameter diptube can be used to act as a stilling well. Measurements should be made inside the tube, provided it is long enough for the end of the tube to be submerged by at least 5 ft. If the top of the diptube is higher than the measuring point, this may be used as an alternate measuring point, but the difference must be recorded in the field notebook and on the Water Level Reading Forms (Exhibit A).

4.3. Potential Sources of Error

Be aware of the potential sources of error that can affect water-level measurements:

- Dirt, scum, oil, or floating product on the water surface can affect closure of the electric circuit in the water-level probe.
- The meter may not register if the electrical conductivity of the water is extremely low (e.g., deionized water).
- Cascading water, leaking casing, drilling mud, or excessive condensation in the wellbore can cause the water-level probe to signal contact with water before the probe encounters the static water level in the well. This effect may be overcome using the sensitivity adjustment (if





available).

- Changes in air pressure can cause small fluctuations in the water level.
- The water-level probe will not produce a signal if the battery is flat, if the switch on the reel is in the "Off" position, or if the sensitivity adjustment is set too low.
- In very deep wells (i.e., over 500 ft), the measurement of the water levels may be affected by non-verticality of the well, and by stretching of the electrical sounder tape.
- It is all too easy to misread the calibrated tape. Check each reading again immediately after noting it down.

4.4. Care of the Equipment

The electric water-level sounder is an expensive piece of equipment that should be treated with care:

- Avoid situations where the probe may become caught or stuck down-hole, for example, near casing centralizers or pump riser columns.
- Exercise control over the tape as it unwinds, especially into deep and/or uncased holes.
- Avoid abrasion of the electric tape against the lip of the casing: this causes excessive wear and eventual failure of the electric wires inside the tape.
- Rewind the tape evenly with markings visible, and avoid twisting or pulling on the tape.
- Clean and dry the tape and probe as they are removed from each well.
- Replace the probe in its protective sleeve (if available) after cleaning.
- Store the electric water-level sounder in a clean and dry, secure place.

5.0 RESPONSIBILITY

5.1. Field Engineer/Geologist/Hydrogeologist/Technician

Responsible for making and recording measurements in compliance with this technical guideline and taking reasonable care of the equipment while it is in their possession.

5.2. Task Leader

Responsible for:

- Direct supervision of personnel taking the measurements
- Designation of measuring points on wells or boreholes
- Determination of the maximum cable length required for the electric water-level sounder
- Guidance on the purpose, number, timing, and/or frequency of water-level measurements required
- Assurance that equipment and materials are available to complete the task





5.3. Equipment Manager (Where Applicable)

Responsible for:

- Maintenance of the electric water-level sounder in full working order
- Replacement or repair of damaged tape, probe, or other malfunctioning parts of the sounder
- Periodic calibration of the sounder tape to ensure markings are correct
- Procuring, checking, calibrating, and returning any water-level sounder obtained by rental.

6.0 EQUIPMENT AND MATERIAL

- Electric water-level sounder with integral cable of sufficient length for the well(s) being measured.
- Field notebook and/or appropriate Water Level Reading forms (Exhibit A).
- Data on well locations, identification number, depth, measuring point description and elevation above survey datum, and previous or most recent water-level measurements (if available).
- Decontamination solution, distilled/deionized rinse water, and a clean cloth or paper towels.
- Indelible ink pens.
- Spare battery for electric water-level sounder.

7.0 GUIDELINE

- Each water level probe or measuring tape used for recording water levels shall have the depth graduations calibrated by the Equipment Manager. Confirm that calibration is current by checking the "next due" date on the calibration sticker located on the equipment.
- Record project number, project name, location, and state.
- At each well, record the date, time, well identification number, measuring point description (e.g., top of PVC casing), measuring device type, manufacturer, and serial number and Golder equipment identification number (if applicable).
- Clean all downhole instruments and equipment before and after measurements and between wells with a non-phosphate detergent rinse followed by a rinse with approved tap water, then rinse with organic-free distilled/deionized water. The probe should be dried with a clean cloth or paper towel after cleaning.
- At least once at each well: measure and record the approximate distance from ground level to the measuring point. Measure the vertical distance from the top of casing, standpipe, monument, or other relevant points of reference to the measuring point, as appropriate.
- Turn on the electric water-level sounder, check the battery using the test switch or button, lower the probe into the well and stop at the depth where the bulb or audible beeper indicates a completed circuit. Raise and lower the water-level sounder a small distance to break and remake the circuit, confirming that the water level can be repeatedly identified, and carefully establish the point at which the sounder circuit just closes. Record the length of the tape





below the measuring point by reading the value indicated on the tape directly level with the measuring point, to the nearest 0.01 ft.

- Enter all water level measurements in a field notebook, or directly on a Water Level Readings Form (Exhibit A). The personnel making the measurement should initial or sign each measurement recorded, and make any additional comments pertinent to the data collected.
- If a field notebook is used, water-level measurements should be carefully transferred to a Water Level Readings Form (Exhibit A), if required, at the earliest convenient time. All water level measurement records shall be maintained in the project records files.
- Water-level measurements should be tabulated in a spreadsheet or entered into an electronic database file for project use. The spreadsheet or database should facilitate the calculation of water levels as elevations relative to the appropriate survey datum. New water levels should be reviewed for consistency with previous measurements from the same location (for example, by plotting a hydrograph). Significant deviations that lack a clear physical cause (e.g., seasonal recharge, influence of pumping, borehole construction changes, use of packers or slug tests, barometric influences, etc.) should be investigated. If necessary, spurious water-level measurements should be retaken and erroneous values annotated in the data record.

8.0 REFERENCED GUIDELINES

Golder Technical Guideline TG-1.4-6b, "Automated Groundwater Level Measurement".

9.0 ADDITIONAL GUIDELINES AND PROCEDURES

Driscoll, F.G., 1986. Groundwater and Wells. (2nd Edition) Johnson Filtration Systems Inc., St. Paul, Minnesota.

American Society for Testing and Materials, 2001. Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well), ASTM D-4750-87(2001).





EXHIBIT A



RECORD OF WATER LEVEL READINGS

Comments Location _ By Survey Mark Water Level Elevation Elevation Survey Mark Correction Measuring Device/Measurement Vater Level Serial No. Point (M.P.) below M.P. Project Name _ Tine Date Job. No. Bore-Hole No.



Technical Procedure

Number:	TP	1.2-26	R	evision	0
---------	----	--------	---	---------	---

Title: SURFACE WATER SAMPLING METHODS

Prepared by	Approved by	Approved by	Effective Date	Rev. Level
Tray Hunts	John Velin	Thomas	5/1/98	0
		<u> </u>		
			,	
	,			

1. PURPOSE

This document describes the sampling protocols used by Golder Associates to collect surface water samples. It contains sampling instructions and information concerning appropriate containers, preservation, and handling of water quality samples.

2. APPLICABILITY

This technical procedure is applicable to any persons involved in the collection of surface water samples. It is applicable to all geographic areas.

3. DEFINITIONS

3.1 Analytical Request Form

Standard form provided by analytical laboratories. This form is filled out by the person collecting samples and is used to indicate how each sample is to be analyzed. This form is often combined with the Chain-of-Custody Form in a single document.

3.2 Chain-of-Custody Form

Standard form used to track the movement of sample containers from the time they leave the field until they arrive at the specified laboratory. The Chain-of-Custody form provides a clear record of sample transport and handling, thereby reducing the risk of sample loss during transport. This form may be combined with the Analytical Request Form in a single document.

3.3 Chemical Analysis

Analytical procedure used to measure the *amount* of a certain compound, or group of compounds, present in a sample.

3.4 Preservatives

Preservatives are used to maintain sample integrity from the time a sample is collected until it is analyzed. Sample preservation may involve adding acid or other fixatives to collected waters or simply keeping them refrigerated. Sample-specific requirements are outlined in this document (Table 1); preservatives, when required, are provided by the analytical laboratory.

3.5 Sample Bottles

Sample bottles are containers specifically designed and prepared for storing liquid samples. Sample bottle type, material, size, and type of lid are specific for particular groups of analytes. Sample bottles must be properly cleaned and prepared by a laboratory or the manufacturer. Table 1 summarizes bottle type and preparation requirements.

SURFACE WATER SAMPLING METHODS

3.6 Surface Water Sample

A surface water sample is defined as water acquired from a surface water body for chemical analyses that is representative of surface water within the cross-section of a lake, stream, or river being sampled.

3.7 Quality Assurance/Quality Control (QA/QC)

Quality Assurance refers to a detailed protocol used to produce high quality products, while Quality Control refers to the process by which this protocol is tested to ensure that final products are of the specified quality. With reference to water sampling, QA protocol includes the use trained personnel, proper sampling methods, clean containers and equipment, proper sample preservation and transportation and detailed documentation of the entire process; field, travel and other assorted test blanks are used for Quality Control testing.

3.8 Sample Types

3.8.1 Grab Samples

Sample containing water collected during a single sampling event (i.e., water taken from a given place at a given time).

3.8.2 Composite Samples

Sample containing a mixture of water collected from multiple locations or from different times at the same location.

3.8.3 Equipment Blanks

Equipment blanks are used to detect contamination from sampling equipment. They are prepared by rinsing precleaned equipment with deionized water and collecting the rinsate into an appropriate container.

3.8.4 Field Blanks

Field blanks are used to detect contamination during sample collection and transport. They are prepared during a sampling event by filling the appropriate container with deionized water. Field blanks are usually used in situations where there is reason to suspect that contamination will occur during sample collection and transport.

3.8.5 Travel Blanks

Travel blanks detect sample contamination during transport. Travel blanks consist of pre-filled bottles provided by the analytical lab. They accompany empty sample bottles to the field site,

where they are left intact and unopened inside the shipping cooler. The unopened travel blanks are then returned to the analytical lab to be analyzed along with collected samples.

3.8.6 Field Spikes

Field spikes are used to measure the performance of the complete analytical system, including sample handling, preservation and storage, as well as interference from the sample matrix. To generate a field spike, field personnel fill the usual sampling container with sample, leaving a small amount of space at the top. They then add a specified amount of the chemical or compound of interest to the bottle and submit it with the rest of the samples. In general, field spikes are not recommended due to the logistical difficulties of transporting concentrated solutions in the field. If there is reason to doubt the performance of the sampling system, then a separate study involving field spikes should be carried out.

3.8.7 Standard Reference Samples

Standard reference samples, or blind QA samples, are samples of known concentration that are submitted to the analytical lab as a normal sample. The lab is not informed about the identity of the sample until after all analyses are complete.

3.8.8 Replicate Samples

Replicate samples are used to evaluate within-site variation. Replicate samples are collected by filling multiple containers at a single site. They are labeled and preserved individually and are submitted separately to the analytical laboratory. Check the field sampling plan (FSP) for the number of replicate samples required per sampling site.

3.8.9 Split Samples

Split samples are used to check analytical variation. A single sample (e.g. grab) is collected and is split into two sample containers. These are labeled and preserved individually and are submitted separately to the analytical laboratory.

4. REFERENCES AND SUGGESTED READING

- ASTM, 1994, Annual Book of Standards, Volume 04.08, 1994, American Society of Testing and Materials, Philadelphia, PA.
- Clesceri, L.S., A.E. Greenberg and R.R. Trussell. 1989. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington, D.C.
- Feldt, L., Editor, 1987, A Compendium of Superfund Field Operations Methods, U.S. Environmental Protection Agency Report No. 9355.0-14, Washington, D.C.
- Golder Associates Inc. Quality Procedure QP-11.1, "Calibration and Maintenance of Measuring and Test Equipment."

Golder Associates Inc. Technical Procedure TP-1.2-23, "Chain of Custody."

- U.S. Department of the Interior, 1977, National Handbook of recommended methods for water-data acquisition, Reston, VA.
- U.S. EPA, 1994, U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganics Data Review, EPA 540/R-94/013, U.S. EPA Office of Emergency and Remedial Response, Washington, D.C.
- U.S. Geological Survey, 1982, Measurement and Computation of Streamflow: Volume 1 and 2. Washington, D.C.
- U.S. EPA, 1986, Test Methods for Evaluating Solid Waste (SW-846), 3rd Edition (Final Update III, December 1996), U.S. EPA/Office of Solid Waste, Washington, D.C.
- 40 CFR 136, U.S. EPA, Guidelines Establishing Test Procedures for the Analysis of Pollutants. Title 40 Part 136 of the Code of Federal Regulations.

5. DISCUSSION

5.1 Sampling Procedures

Samples are collected as representative pieces of a larger puzzle. Ideally, they should describe all of the characteristics of the larger body from which they originate, which, by its very definition, is too large to analyze directly. As a result, it is very important to follow a well-organized sampling plan and to preserve sample integrity throughout the collection and transportation process.

5.1.1 General Practices

Usually, analytical laboratories will provide pre-cleaned sample containers, shipping containers, required forms for sample submission and specific sample shipping instructions. It is important to check with the lab that these arrangements have been made. Similarly, field crews should familiarize themselves with the FSP before initiating a sampling program. By reviewing the instructions, personnel can ensure that they have all of the equipment they require to fulfill the objectives of the sampling program. Field crews will also then be aware of the types of samples they are being asked to collect, be they grab samples, composite samples or QA/QC test blanks. Finally, sample crews should organize themselves such that samples will be collected and shipped during the early part of the work week to avoid delays caused by weekend shipping or make specific arrangements with laboratories to receive samples on the weekend.

Sampling Locations. General sampling locations are described in FSP. However, field crews will have a certain degree of freedom in choosing the exact locations from which to take the samples. When selecting these sites, personnel should consider the layout of the local

environment, project objectives and personal safety. They should then choose areas that are both easily accessible and representative of the target waterbody or waterbodies.

Once sampling sites have been identified, they must be described relative to permanent landmarks, such as groundwater wells, outfalls or distinctive landscape features; measuring the distance from permanent landmarks to each site with an appropriate compass heading is recommended. Ideally, one should try to use the Global Positioning System (GPS), but locations can also be recorded as the perpendicular distance from the shoreline and the distance upstream or downstream of a permanent landmark.

Sample Collection. Where possible, start sampling at the least contaminated site (i.e., the reference site) and move from there to the more contaminated areas.

If sampling equipment must be used, then it must be cleaned before and after use. This may involve rinsing with ambient water, cleaning with soap and water, acid washing, rinsing with organic solvents or pure water, or a combination of these. Refer to the FSP for details.

Each sample bottle must be labeled at the time of collection with either waterproof, permanent marker or using pre-printed waterproof labels. See section 5.3.2 for details of label format.

When sampling, it is important to rinse sample containers 3 times before taking a sample. Rinse each bottle by partially filling it with ambient water, loosely attaching the cap and shaking the bottle; drain the water and repeat the process. As a general rule, rinse plastic bottles unless instructed otherwise by the analytical laboratory. Bottles that already contain the appropriate preservatives and containers for the following analyses should *not* be rinsed prior to taking the sample:

- volatile organic compounds (VOCs), including total volatile hydrocarbons (TVH),
- total extractable hydrocarbons (TEH),
- BTEX (benzene, toluene, ethylbenzene and xylene)
- total petroleum hydrocarbons (TPH; includes TVH, TEH and BTEX); and
- bacteriological testing (e.g., fecal coliforms).

Carefully fill sample containers, without splashing, leaving only enough space for preservatives (if required - see Table 1). Be sure to keep hands and fingers downstream of bottle opening and sample upstream of bridges, boats and yourself to prevent sample contamination. The samples will be collected in flowing water, unless otherwise specified in the FSP, from areas where the flow is well mixed. If no preservatives need to be added, completely fill the bottles and cap tightly. There should be as little air in the containers as possible, as it can affect sample integrity.

Whenever possible, fill sample containers directly from the source, without using an intermediate container to transfer the sample. This avoids potential sample contamination due to carry-over from one sample to the next. Also, take care to avoid contaminating sample

waters through contact with rubber, oil, gasoline and other machinery fluids, metal-based paints, cigarette ash, paper tissues and other such material.

Sample bottles should then be stored appropriately (Table 1). In most cases, this will involve keeping the sample cool (4°C) and dark. Samples should never be allowed to freeze and should be shipped as soon as possible to the appropriate analytical lab, in coolers with reusable ice packs. Avoid using bags of ice purchased from convenience stores; the water that leaks out of these bags as the ice melts may ruin sample labels.

Chain-of-Custody and Analytical Request forms must accompany all samples (one set of forms per sample shipment). Prior to shipping, the person submitting the sample should inform the analytical lab by telephone, e-mail, or fax that the samples will be arriving. As well, he or she should check back later to confirm arrival of the samples and to explain analysis requests if needed.

5.1.2 Sampling for Metals

When collecting samples for a metals analysis, it is important that sample waters do not come into contact with any metal products. Samples for metals analysis also have other stringent collection and preservation requirements (Table 1). For example, waters collected for dissolved metal analysis have to be field-filtered using a $0.45\,\mu\mathrm{m}$ polycarbonate or cellulose acetate filter and then preserved with acid. Field-filtering should be conducted as soon as possible after sampling. If field-filtering is not possible, then acid preservatives should not be added and the laboratory should be notified to filter the sample as soon as possible after sample receipt.

Field crews need to be aware of these restrictions to ensure that samples are taken correctly and that they maintain their integrity until they can be analyzed. Special sampling and preservation instructions should be included in the FSP.

5.1.3 Sampling for Organic Chemicals

In addition to the general principles outlined above, there are specific protocols associated with sampling for organic measurements. As described above, sample bottles should *not* be rinsed prior to taking samples for certain organics analyses. It is also very important to completely fill each bottle, as certain organics will volatilize into the overlying air space and will be lost after opening the bottle. Finally, proper containers must be used when sampling for organics, since some bottles will release or absorb organic compounds when filled with water. Generally, glass containers are used, but certain tests may require other materials; be sure to obtain the appropriate sample bottles from the analytical laboratory and refer to the FSP.

5.2 Sample Documentation

Proper sample documentation is important because lack of careful documentation can lead to misunderstandings and questionable test results. Components of proper documentation of field activities are described below.

5.2.1 Field Notebooks

Field notebooks must be kept, describing all field activities. Format of field notes and information to be recorded should follow Golder Associates' specific guidelines. During the field survey, field notes must be maintained in a permanent, safe location at the field site where samples are collected. If possible, new entries in the field note book should be photocopied at the end of each field day and copies should be stored in a safe place.

5.2.2 Sample Labels

Sample labels must contain the following information:

- Sample identifier (name of site or sample code);
- Date (written as day/month/year; month abbreviated as three letters) and time (24 hour clock) of collection;
- Initials of collector; and
- Analysis requested (this is usually done by the analytical laboratory in the form of a code on the sample bottle).

Fill out labels at the time of collection using waterproof ink and affix a label to each sample container. Plastic bottles may be labeled by writing directly on the bottle using a waterproof marker; however, this approach is not recommended if samples are transported over long distances (friction may rub label off) or if bags of ice are used to keep the samples cool (water may damage label information).

5.2.3 Custody Seals

Numbered seals should be used (when required by the FSP) to detect tampering with samples in transit. Attach the seal in a way that it is necessary to break it to open the cooler containing the samples. The number on the custody seal should be recorded in the field note book and on the Chain-of-Custody and Analytical Request forms

5.2.4 Chain-of-Custody Forms and Analytical Request Forms

Chain-of-Custody and Analytical Request forms must accompany all samples submitted for analysis in accordance with procedure TP1.2-23, "Chain of Custody". These forms are usually combined as a single document. An example of Golder Associates' combined Chain-of-Custody and Analytical Request Form is provided in Exhibit 1.

The combined form must be filled out completely and the white and yellow copies should be sent along with the samples being submitted. Field personnel should retain the pink copy after it is signed by the shipper. Depending on the shipping container, these forms can either be enclosed inside the sealed container or attached firmly to the outside of the container. In either

case, it is advisable to enclose the forms within a waterproof plastic bag to guard against damage. It is important that each person having custody or control of the samples identify themselves on this form. This means the person collecting the sample; intermediate persons involved in packaging, storing or transporting the sample; and the person accepting the sample on behalf of the analytical lab must all be identified.

5.3 Sample QA/QC

The main goal of sample QA/QC is to monitor for various sources of contamination during sample collection, transport and analysis. This process will involve the use of field, travel and other test blanks. QA/QC programs are designed on a project-specific basis. Details of individual QA/QC programs are described in the FSP.

6. EQUIPMENT AND MATERIALS

6.1 Sampling

The following is a list of sampling equipment generally recommended for surface water sampling:

- Pre-cleaned sample bottles and required preservatives (usually supplied by the analytical laboratory)
- Coolers and reusable ice packs
- Waterproof labels and permanent markers
- Sampling equipment (e.g. Kemmerer or Van Dorn bottles)

6.2 Site Location and Sample Documentation

For proper sample site identification and sample documentation, field crews may need:

- Bound, water-proof field logbooks
- Maps
- Air photos
- Indelible ink pens and pencils
- Long tape measure
- Survey flagging tape
- Compass
- GPS unit
- Combined Analytical Request and Chain-of-Custody forms

6.3 Health and Safety

The following health and safety equipment is recommended for surface water sampling:

- Waders and waterproof gloves
- Heavy socks, warm pants, rain gear and other articles of clothing suitable for prolonged water work
- Extra set of clothes
- First aid kit
- Approved personal floatation device for deep water or boat work

\$:/groups/qa/ip3-1024/TP1_2-26.doc

TABLE 1

SAMPLE CONTAINER CODES, TYPES, VOLUMES, PREPARATION, SPECIAL HANDLING, PRESERVATION, HOLDING TIMES Page 1 of 2

Analysis	Cont. Code	Containers, Water	Handling and Preservation	Holding Time
Volatile Organics	٧	2, 40ml glass vial teflon lined septum	Store 4±2°C; handle upwind from equip. Funes, no headspace permitted; Pres with HCl to pH <2 for volatile aromatics	7 days 14 days (HCl pres.)
Base/Neutral and Acid Extractable Organics	SV	2, 1 liter amber glass, teflon lined cap	Store 4±2°C; handle upwind from equip, fumes; no contact with plastics, gloves	7 days until extraction 40 days thereafter
Organochlorine Pesticides and PCBs	Ь	2, 1 liter amber glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes; no contact with plastics, gloves	7 days until extraction 40 days thereafter
Herbicides	Н	2, 1 liter amber glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes; no contact with plastic, gloves	7 days until extraction 40 days thereafter
Total Fuel Hydrocarbons (Fuel Fingerprint)	ТН	1, 125 ml amber glass, teflon lined septum	Store 4±2°C; handle upwind from equip. fumes, no headspace permited; pres with HCl to pH <2	14 days
Total Petroleum Hydrocarbons or Oil and Grease	DO	1, 1 liter glass, teflon lined cap	Store 4±2°C; handle upwind from equip. fumes, no contact with gloves or plastics; pres with HCl to pH <2	28 days
Cyanide (total)	Ŋ	1,1 liter plastic	Store 4±2°C; pres with NaOH to pH >12	14 days
Sulfide (total)	S	1, 1 liter plastic	Store 4±2°C; pres with ZnOACNaOH to pH >12	7 days
Chloride, Sulfate, pH Conductivity and Total Dissolved Solids	MA	1,1 liter plastic	Store 4±2°C.	28 days (Chloride, sulfate and conductivity) Analyze on-site (pH) 7 days (TDS)

TABLE 1

SAMPLE CONTAINER CODES, TYPES, VOLUMES, PREPARATION, SPECIAL HANDLING, PRESERVATION, HOLDING TIMES, Page 2 of 2

Analysis	Cont. Code	Containers, Water	Handling and Preservation	Holding Time
Major Cations and Metals	TM	1,1 liter plastic	0.45 um filter, pres with HNO3	6 months (28 days for mercury)
			to pH <2	
Gamma Emitting Radionuclides	GR	2, 1 liter plastic	0.45 um filter, pres with HNO ₃	6 months
			to pH <2	(record exact date/time or sampling for calculation of half-life decay)
Alpha Emitting Radionuclides	AR	2, 1 liter plastic	0.45 um filter, pres with HNO3	6 months
			to pH <2	(record exact date/tune or sampling for calculation of half-life decay)
Beta Emitting Radionuclides	BR	2, 1 liter plastic	0.45 um filter, pres with HNO3	6 months
			to pH <2	(record exact date/time or sampling for calculation of half-life decay)
Total Phosphorus, Ammonia-N,	TP	1, 1 liter plastic	Store 4±2°C; pres with H ₂ SO ₄	28 days
Nitrate/nitrite-IN, COD and 10C			to pH <2, store in dark	
Orthophosphate	OP	1, 1 liter plastic	0.45 um filter, store 4±2°C	48 hours

REMARKS (with initials) Received by: (Signature/Firm) Received by: (Signature/Firm) WYO N C TOMINI NASE Remarks (attachments if necessary) ON 7638 Relinquished by: (Signature/Firm) Relinquished by: (Signature/Firm) CHAIN OF CUSTODY RECORD ANIONATIVE SHOUNT NO. OF CON-TAINERS Received by: (Signature/Firm) Received by: (Signature/Firm) Received by: (Signature/Firm) SAMPLE IDENTIFICATION MEDIA SAMPLE SITE/LOCATION Relinquished by: (Signature/Firm, Relinquished by: (Signature/Firm) Relinquished by: (Signature/Firm) TIME SAMPLERS: (Signature) DATE PROJ. NO. STA. NO.

EXHIBIT 1
CHAIN OF CUSTODY FORM
DEPUE/SURFACE WATER/IL



Technical Procedure

	Number: TP1.2-27, Rev 0 Title: Measurement of Stream Discharge Using a Current Meter						
Prepared by	Approved by	Approved by	Effective Date	Rev. Level			
Bryony Hansen	walf weight	1/24/2000	1/13/2000	0			
	11/20/20						

1. PURPOSE

This document describes the protocols used by Golder Associates to measure stream discharge with a current meter.

2. APPLICABILITY

This technical procedure is applicable to Golder persons measuring stream discharge with a current meter.

3. DEFINITIONS

3.1 Current Meter

A current meter is an instrument used to measure velocity of water flow.

3.2 Discharge

Discharge (or stream flow) is defined as the volume rate of flow of water and is usually expressed in cubic feet per second (cfs). Stream discharge is computed by measurements of velocity and depth across a river channel.

4. REFERENCES AND SUGGESTED READING

Rantz, S.E. et al, 1982. Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge: Volume 2. Computation of Discharge. Geological Survey Water-Supply Paper 2175.

5. EQUIPMENT AND MATERIALS

5.1 Stream Gaging Equipment

The following is a list of equipment generally recommended for stream gaging:

- Current meter (e.g. a horizontal-axis rotating screw or propeller type meter such as a Pygmy, Price AA, or Model 3000 Swoffer, or a magnetic distortion meter such as the Marsh-McBirney);
- Measuring rod (on which to mount the meter when measurements are made by wading);
- Over the boat set up (on which to mount the meter when measurements are made from a boat);

- Buoyant rope (of sufficient length span the stream channel);
- Long tape measure;
- Survey flagging tape;
- Survey rod;
- Waterproof field log books;
- Maps; and
- Indelible ink pens and pencils.

5.2 Health and Safety

The following health and safety equipment is recommended for measurement of stream discharge:

- Waders;
- Waterproof gloves;
- Heavy socks, warm trousers, rain gear, and other articles of clothing suitable for prolonged water work;
- Extra set of dry clothes;
- First aid kit; and
- Approved personal flotation device for deep water or boat work.

6. PROCEDURE

- 1. Research background/historic information. So as to know what to anticipate in the field, the hydrographer shall research the reach of the river, which will be gaged. Useful information to know prior to gaging include: 1) location of USGS stream gaging stations and expected ranges of discharge for the time of year; 2) accessibility of the reach and mode of transport to the cross sections, and; 3) a topographic map of the reach showing approximate location of the cross sections to be gaged and the locations of significant tributaries.
- 2. Choose suitable cross section. Ideally, the chosen cross section should have the following qualities:
 - Relatively straight channel,
 - depths > 0.5 feet,
 - Relatively uniform bed elevations across the channel,
 - Relatively uniform, non-turbulent flow, and

Relatively close to the staff gage, if one is used to measure stage.

Cross sections will often not meet all the above criteria, so field personnel must exercise judgement in selecting the best site(s) available.

- 3. Determine the stream's width and the number of stations to be gaged. A tag line and measuring tape shall be strung across the river perpendicular to flow. The channel width (from waterline to waterline) shall be noted from the tape and the channel divided into 10 to 30 sections. The actual number of stations will depend on the magnitude discharge (higher discharge requires more stations) and the channel width (wider channels require more stations). Stations should be more widely spaced in low velocity areas. Stations should be concentrated where the largest amount of flow moves through the cross section.
- 4. Determine station's depth. The depth of each station shall be measured with a rigid measuring rod (upon which the meter is attached) and recorded in the field
- Velocity measurement. Velocity measurements shall be made with the current meter propeller pointed into the current. Measurements shall be made for a 40 second duration with the current meter set at a depth of 0.6 of the total channel depth where the total channel depth is 4.5 feet or less. Where the channel depth is greater than 4.5 feet, velocity measurements shall be made by calculating the average of velocity measurements taken over a 40 second duration at 0.2 and 0.8 of the total channel depth.

Current meter measurement by wading

The field personnel shall stand downstream and to the side of the current meter. The wading rod shall be held in a vertical position with the meter facing into and perpendicular to the water surface. For safety, the USGS rule of 10 should be followed: when the product of depth and velocity is greater than or equal to 10, the stream is unsafe to wade.

Current meter measurements from cableways

Cableways provide a track for the operation of a cable car from which the hydrographer makes current meter measurements. As a rule of thumb, the size of sounding weight (lb) used to maintain the propeller perpendicular to the flow should be greater than the maximum product velocity (ft/s) and depth (ft) in the cross section. The hydrographer shall wait until cable car oscillations have stopped before making current measurements. To ensure the pivot and rotor of the meter are free of debris, the meter shall be raised for inspection between each set of measurements. Pliers shall be carried by the hydrographer in the event that the weight and meter become caught.

Current meter measurements from bridges. Whether to use the upstream or downstream side of the bridge shall be decided based on favorable hydraulic characteristics, physical conditions, and ability to view approaching drift. If velocities are high, the equipment shall be used no closer than a couple of feet from piers and abutments. The velocity is measured by setting the meter positions in the vertical as indicated in the table below.

		Minimur	n Depth	
	0.6 me	ethod	0.2 and 0.	8 method
Suspension ¹	(ft)	(m)	(ft)	(m)
15 C .5, 30 C .5	1.2	0.37	2.5	0.76
50 C .55	1.4	0.43	2.8	0.85
50 C .9	2.2	0.67	4.5	1.37
75 C 1.0, 100 C 1.0, 150 C 1.0	2.5	.076	5.0	1.52
200 C 1.5, 300 C 1.5	3.8	1.16	7.5	2.29

Notes:

1. 50 C refers to a 50-lb weight, the suspension for which puts the meter 0.9 feet above the bottom of the weight.

Current meter measurements from boats. This methodology shall be used in the event that cableways and bridges are unavailable and the stream is too deep to wade. Care shall be taken to ensure that the tag line across the channel is visible to traffic on the river. Boat measurements are not recommended where velocities are slower than 1 ft/s and when the boat is subject to wind and wave action. If the maximum depth in the cross section is less than 10 ft and the velocity is low, a current meter mounted on a rod can be used. For greater depths and velocities, an over-the-boat set up can be used which utilizes a weight and vane to ensure that the propeller blades are maintained perpendicular to the river flow.

6. <u>Calculation of discharge</u>. Total river discharge is estimated by summing the discharge within each subsection where, the discharge within each subsection is the product of the subsection width, midpoint depth, and average velocity. Figure 1 illustrates the discharge calculation. The field log sheet presented as Figure 2 provides a detailed overview of the discharge calculation.

7. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

7.1 Current Meter Set Up and Calibration

Prior to use in the field, the current meter should be checked to ensure it is adequately calibrated. The check shall include: 1) communication with the maintenance technician / manufacturer as to the status of the meter, and 2) a field test to ensure the meter is operating correctly. Field tests vary according to the meter used:

• Field tests on <u>Pygmy and Price AA meters</u> involve spinning the meter and timing the duration it keeps spinning. Spin tests should be conducted where wind will not influence the duration the meter spins. All spin test results should be noted in the fieldbook. The minimum spin duration for Pygmy meters (recommended for gaging velocities that range 0.25 to 3.0 fps) is 60 seconds. The minimum spin duration for Price AA meters (recommended for gaging velocities to and beyond 3.0 fps) is three minutes. If the meter fails to spin for these minimum durations, the gaging pin or resisting wire is adjusted or the meter is oiled, and the tests are

- repeated. Test iterations should continue until the meter passes. If the meter does not pass despite multiple adjustments, the last spin test result should be noted, and gaging should proceed with errors in the meter's operation noted.
- Field tests for <u>Swoffer meters</u> involve walking the propeller a known distance through a stationary body of water (e.g. a swimming pool, lake, or large, still water pool in a river) and recording the duration of the test with a stop watch. The distance divided by the duration of the test should be within +/- 5 percent of the meter's velocity reading. If two swoffer meters are used, (e.g. a wading and over the boat set-up) the meters shall be tested in the same location to ensure the meters record similar velocities.
- Field tests for <u>Marsh-Mcbirney meters</u> involves verifying the measured flow velocity with a Pygmy or Price AA meter that passed its spin test. If several velocities measured by the Marsh-Mcbirney and the Pygmy or Price AA meter are each more than +/- 5 percent of one another, the Marsh-Mcbirney should be recalibrated according to the manufacturers specifications or replaced with a meter that passes its calibration tests.

Meter calibrations should be checked daily using the appropriate field test described above. Field personal should be familiar with the meter calibration procedure by communicating with the maintenance technician / manufacturer's representative and by reading the user's manual.

7.2 Consistency Between Consecutive Readings and Control

As a means of field checking total discharge results, field personnel shall compare consecutive total discharge results to each other and to control sections, where available (such as USGS stream gaging stations). With reference to field conditions (i.e. presence of tributaries to the channel, groundwater inflow), the field personnel shall use judgement as to the validity of the results. Streamflow often decreases where a channel flows from a hillslope contained reach into a floodplain bordered reach; such an explanation can help identify reasons for decreases in flow between two gaged stations. If an inexplicable difference between total discharges is identified, the field personnel, where practical, shall field check the equipment and repeat discharge measurements for the river section for which the total discharge appears erroneous.

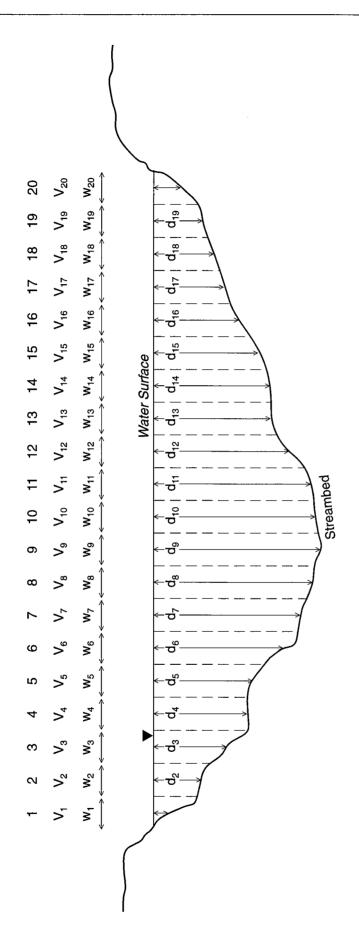
7.3 Triplicates

One triplicate set of discharge measurements shall be made for at least every five gaged cross sections. The purpose of triplication is to assess the percentage error range inherent in stream gaging (typically +/- 5 to 15%) and to provide an added degree of confidence in field results.

7.4 Propeller Size

The field personnel shall ensure that the current meter propeller size is appropriate for the anticipated river flows. In general, larger propellers are used for low flow velocities and vice-versa. The field personnel shall refer to the manufacturer's manual to ensure that the appropriate propeller size is used.

TP 1.2-27 rev0.doc



= average velocity (ft/s) (calculated by averaging 4 field current-meter velocity readings) V₁₋₂₀

= subsection widths (ft) W₁₋₂₀ = subsection mid-point depths (ft) d₁₋₂₀ Total Discharge = $(V_1 * w_1 * d_1) + (V_1 * w_2 * d_2) ... + (V_{20} * w_{20} * d_{20})$

DEFINITION SKETCH OF MID-SECTION METHOD OF COMPUTING STREAM DISCHARGE FIGURE

FIGURE 2

Calculation of Stream Discharge

Silver Valley Natural Resource Trustees/Coeur d'Alene/ID 963-1416.910 Flow Information Sheet

Section 1 - South Fork Coeur d'Alene, 250 ft downstream of Pine Creek

Date: 9/24/98 Weather: Sunny, 75 °F

Comments: All velocity

measurements made

at 0.6 of total

Time: 10:00 to 12:30
Operator: B.Hansen/J.Gunter

/I.Gunter r

measured depth.

Current Meter: Swoffer (Model 3000, 2" diam propeller # 1)

Stage (m): none

Total Cross-Sectional Area (ft²): 56

Total Gaged Flow (cfs): 90.72

=/-8% Total Gaged Flow (cfs): 9.07

Station	Distance	Width	Depth	Area	Avg. Velocity	Flow	
ID	(feet)	(feet)	(feet)	(feet²)	(ft/s)	(cfs)	Comments
0	0.00		0.00				North Bank
	1.25	2.50	0.30	0.75	0.00	0.00	
1	2.50	-	0.25				sub-sample #1
	3.75	2.50	0.45	1.13	0.11	0.12	•
2	5.00		0.55				
	6.25	2.50	0.60	1.50	0.02	0.03	
3	7.50		0.40				sub-sample # 2
ļ	8.75	2.50	0.75	1.88	0.13	0.24	
4	10.00		0.60				
	11.25	2.50	1.10	2.75	0.02	0.06	
5	12.50		1.10				sub-sample # 3
	13.75	2.50	1.15	2.88	0.49	1.41	
6	15.00		1.10				
	16.25	2.50	1.15	2.88	0.39	1.12	
7	17.50		1.30				sub-sample # 4
	18.75	2.50	1.45	3.63	1.52	5.51	
8	20.00		1.45				
	21.25	2.50	1.65	4.13	1.06	4.37	
9	22.50		1.60				sub-sample # 5
	23.75	2.50	1.60	4.00	1.63	6.52	
10	25.00		1.60				
	26.25	2.50	1.60	4.00	2.04	8.16	
11	27.50		1.55				sub-sample # 6
	28.75	2.50	1.50	3.75	3.10	11.63	
12	30.00		1.60				
	31.25	2.50	1.45	3.63	3.06	11.09	
13	32.50		1.45				sub-sample # 7
	33.75	2.50	1.50	3.75	2.94	11.03	
14	35.00		1.50				_ <u> </u>
	36.25	2.50	1.50	3.75	2.86	10.73	
15	37.50		1.40				sub-sample # 8
	38.75	2.50	1.40	3.50	2.27	7.95	
16	40.00		1.30				
	41.25	2.50	1.25	3.13	1.90	5,94	
17	42.50		1.20				sub-sample # 9
	43.75	2.50	1.10	2.75	1.40	3.84	
18	45.00		0.95				
	46.25	2.50	0.60	1.50	0.64	0.96	
19	47.50		0.40				sub-sample # 10
	48.75	2.50	0.30	0.75	0.04	0.03	
20.0	50.00		0.00	56		90.72	South Bank

APPENDIX D FIELD DATA COLLECTION FORMS

Golder Associates Record of Water Level Readings

Borehole			Measuring Device/		Water Level Below M.P.	Correction to Survey Mark	Elevation	Water Level Elevation	Ву	
No.	Date	Time	Serial No.	Measurement Point	(feet)	(feet)	(feet)	(feet)	(initials)	Comments

Project Name:	Site Name:
Project Number:	Operator:
Investigation Description:	

Page ____ of ____



Golder Associates Well Sampling Form

Project:	Monsan	to Ground	dwater Sampling			Well Id	entification:			
Site: So	da Sprinç	gs, ID				Sampling Method (circle one): Ded / Non-Ded. pump and riser				ed. pump and riser
Job Num	ber: 913	3-1101.60	5			Purge	Method (circle	<u>one):</u> G	iround / Tank	(
Well Spe Hole Diar		ons: d _h =		inches			Volume Calcu Volume (ft ³)=)/2) ² (TD-H)=	
Well Cas Inside D		d _w ID =		inches		$\pi[(d_h/2)$	ack Pore Volui ² -(d _{wl} D/2) ²](TD H, use S. If S	-(S or H))(P) =	
Depth to Water L Base of Base of	evel Seal	op of casin H = S = TD =	ng):	feet feet feet		Total W	/ell Volume (ga : + Vf)*7.48 gal	allons) =	,	0.00
Est. Filter Pack Por		P =	0.25	(decimal)		Minimu Vp = V	m Purge Volur t x 3 =	ne (gallons	s)=	0.0
			Water	Cumulativ	ve Water		Water Ch	aracteristic	CS	
Date	Ti Begin	me Finish	Purged (gal)	Pu (gal)	rged Well Vol	pН	Conductivity (µ mhos/cm)	Turbidity (NTU)	Temperature (° Celsius)	Comments
Sampling			ple Time: :							
Sample I	Number:	1								
			d: Metals, Anions, To			-				
		-	Containers/Preserve	e: 1 L w/ni	tric, 1 L no	preserv.	, 1 250 mL w/s	sulfuric		
Chain of				<i>n</i> 15 "			ABL 5	1475		_
		atory: Pri	mary Laboratory: S\	/L, Kellogg	ı, ID; Split L	.aborato	ry: ARI, Seattle	e, WA		
Date Shi	pped:									
Carrier:										

Project Name:	Project Number:	
Date:	Start Time:	
Location ID:	Field Technician(s):	
Location Description:		

Station		Depth	Velocity 1	Velocity 2	
(Units:)	(Units:)	(Units:	(Units:)	Note
1		(,	,	
					<u> </u>

APPENDIX E QUALITY ASSURANCE PROJECT PLAN



For Groundwater And Surface Water Sampling Monsanto Soda Springs Facility, Soda Springs, Idaho

Quality Assurance Project Plan

Submitted To: Monsanto Company

Soda Springs Plant

Highway 34

Soda Springs, Idaho 83276

Submitted By: Golder Associates Inc.

18300 NE Union Hill Road. Suite 200

Redmond, WA 98052 USA

Distribution:

Copies Monsanto, Soda Springs, Idaho
 Copy EPA Region X, Seattle, Washington

Copy
 Copy
 Stochos Environmental Inc.

2 Copies Golder Associates Inc., Redmond, Washington

April 29, 2010

913-1101.605A





Table of Contents

1.0	PROJECT DESCRIPTION	1
1.1	Project Objective and Historical Background	1
1.2	Site Description	1
2.0	PROJECT ORGANIZATION	2
2.1	Organizational Structure	2
2.2	Use of Subcontractors	3
2.	2.1 SVL Analytical, Inc. Certifications	3
2.	2.2 Analytical Resources, Inc. Certifications	4
3.0	DATA QUALITY OBJECTIVES	5
3.1	Appropriate Field Procedures & Analytical Methods	5
4.0	SAMPLING AND OTHER FIELD PROCEDURES	7
4.1	Selected Procedures	7
4.2	Water Sampling	7
4.3	Document Distribution, Variation Request, and Change Control Considerations	7
4.4	Sample Quantities, Types, Locations, and Intervals	8
4.5	Sample Identification and Labeling Requirements	8
4.6	Sample Container Type, Volume, Preservation, and Handling Requirements	9
4.7	Chain of Custody Considerations	9
4.8	Sampling Equipment Decontamination	9
4.9	Calibration Requirements	. 10
5.0	ANALYTICAL PROCEDURES	. 11
6.0	DATA REDUCTION, VALIDATION, AND REPORTING	. 12
6.1	Minimum Requirements for Laboratory Analytical Data Packages	. 12
6.2	General Validation Requirements	. 12
7.0	QUALITY CONTROL PROCEDURES	. 14
7.1	Field Generated Quality Control Samples	. 14
7.2	Laboratory Quality Control Samples	. 14
8.0	DATA ASSESSMENT PROCEDURES	. 16
9.0	DATA MANAGEMENT	. 17
9.1	Records Management	. 17
9.2	Analytical Data Management	. 17
9.3	Data Review and Reporting	. 17
9.4	Records Turnover	. 18
10.0	REFERENCES	10

List of Tables



Table QAPP-1	Golder Technical Procedures and Quality Procedure Documents
Table QAPP-2	Groundwater Sample Collection/Metal Analytes
Table QAPP-3	Groundwater Sample Collection/General Chemistry Analytes
Table QAPP-4	Groundwater Field Parameter Monitoring List
Table QAPP-5	Groundwater Sample Container Types, Volumes, Handling, Preservation, and
	Holding Times
Table QAPP-6	Quality Control Summary; Metal Analyses
Table QAPP-7	Quality Control Summary; General Chemistry Analyses
Table QAPP-8	Quality Control Summary; Field Parameters



1.0 PROJECT DESCRIPTION

1.1 Project Objective and Historical Background

This QAPP has been written to support specific procedures, analytical methods, and other detailed instructions performed in conjunction with elements of the "Phase II Remedial Investigation Work Plan" (Golder, 1992), the "Work Plan for Drilling and Monitoring Well Installation" (Golder, 2006), and the "Groundwater and Surface Water Sampling and Monitoring Plan" (Golder 2010). The QAPP was generated in significant accordance with the document EPA QA/R-5, 'EPA Requirements for Quality Assurance Project Plans' (EPA, 2001) and provides procedures for making accurate measurements and obtaining representative, accurate, and precise analytical data. Work plan tasks include sampling of monitoring wells, springs, non-contact cooling water, and surface water.

1.2 Site Description

A discussion of the Monsanto Soda Springs site is provided in the Phase II Remedial Investigation Report for the Soda Springs Elemental Phosphorus Plant (Golder, 1995).



2.0 PROJECT ORGANIZATION

2.1 Organizational Structure

Project directors and their contact information are provided in the table below. The organizational structure for field activities for the Monsanto Soda Springs site is provided in the following paragraphs.

	Golder Project Manager	Monsanto Project Coordinator
Contact:	David Banton	Bob Geddes
Company:	Golder Associates Inc.	Monsanto Chemical Company
Address:	18300 NE Union Hill Road, Suite 200 Redmond, Washington 98052- 3333	PO Box 816 Soda Springs, Idaho 83276
Phone:	(425) 883-0777 Work	(208) 547-1234
Faccionila	(425) 503-9331 (cell)	(208)-221-6523
Facsimile:	(425) 882-5498	(208) 547-3312

Project Manager & Quality Assurance Coordinator

The Project Manager, Mr. David Banton, is responsible for planning and executing all environmental sampling and analysis and for preparation of analytical data reports, and all associated Technical memoranda including submittals to the Idaho Department of Environmental Quality (IDEQ) and the US Environmental Protection Agency (USEPA). The Project Manager prepares the specifications for, and administers the subcontracts for laboratory analysis. Mr. Banton also acts as the Quality Assurance Coordinator and, at his discretion, reviews aspects of quality control or directs Golder technical staff to perform tasks to determine if data quality objectives are being met.

Groundwater and Surface Water Sampling and Monitoring Plan Coordinator and Site Health & Safety Coordinator

Mr. Michael Klisch will act as Golder's sampling and monitoring plan coordinator to make contacts for appropriate scheduling, direct subcontractors in the field, collect environmental quality field samples, and to perform and report on other field operations. Mr. Klisch will also act as Golder's on-site Health & Safety Coordinator for safe and effective actions by Golder field employees. Mr. Klisch confers with the Project Manager and provides information to guide completion of the field tasks and to ensure all activities are conducted in accordance with the Groundwater and Surface Water Sampling and Monitoring Plan.

Health & Safety Officer



The Health and Safety Officer, Ms. Amanda Cote, L.G. is responsible for review and implementation of the site Health and Safety Plan (HASP) and communicating the key elements of on-site safety to the field personnel, including; personal protective measures and equipment, emergency preparedness and incident protocol.

Chemist/Validator

The Chemist/Validator, Mr. Tom Stapp reports to the Project Manager. He is responsible for coordinating with the subcontracted laboratories to obtain the required analyses, maintain sample tracking, perform data validation actions and to ensure proper recording of validated data to the database. The Chemist/Validator is responsible for the review and validation of laboratory analysis reports in accordance with guidance documents available from EPA. Mr. Stapp directs maintenance of the data files in the project database, and the generation of spreadsheets and report formats of archived data.

Field Sampling Personnel

Golder Field Sampling Personnel will be selected as necessary for completion of Work Plan elements by the Golder Project Manager. The Field Sampling Personnel are responsible for safe conduct while collecting all field samples in accordance with the Groundwater and Surface Water Sampling and Monitoring Plan and QAPP, and performance of other Technical Procedure actions as cited in the Groundwater and Surface Water Sampling and Monitoring Plan. In addition, the Field Sampling Personnel are responsible for accumulation, organization, and maintenance of all information collected during field activities (including sampling logbook, daily activity logbook, chain-of-custody forms, and water-level measurements).

2.2 Use of Subcontractors

SVL Analytical, Inc., located in Kellogg, Idaho has been selected to perform the primary analytical testing and Analytical Resources, Inc., located in Seattle, Washington will perform split sample analysis. Both laboratories hold certifications from the State of Idaho or by reciprocal agreement with other State certifications appropriate to the analytical testing identified in this QAPP. A summary of certifications for each laboratory is as follows:

2.2.1 SVL Analytical, Inc. Certifications

- State of Idaho Department of Health and Welfare, Drinking Water Laboratory Certification for Inorganic Analytes;
- National Environmental Laboratory Accreditation Program (NELAP) Certification through the Florida Laboratory Accreditation Program for Drinking water, non-potable water, and solids: and
- Adherence to State of Idaho NPDES Testing Standards.



2.2.2 Analytical Resources, Inc. Certifications

- National Environmental Laboratory Accreditation Program (NELAP) Certification through the Oregon Laboratory Accreditation Program for Drinking water, non-potable water, and solids; and
- Accredited for analytical methods listed in QAPP Tables, by the Washington State Department of Ecology.



3.0 DATA QUALITY OBJECTIVES

3.1 Appropriate Field Procedures & Analytical Methods

The primary objective of the field activities are to collect representative groundwater, surface water, spring, and non-contact cooling water samples that can be used to characterize groundwater and surface water quality at the Monsanto Soda Springs site and provide information to assess long and short-term water quality changes.

Tables QAPP-2 through QAPP-4 list all analytical parameters of interest defined for water sample collection during sampling activities. The complete list of parameters may include metal analyses using EPA 200.7, or EPA 200.8 from 'Methods for the Chemical Analysis of Water and Wastes' (EPA, 1983), EPA 6010 or EPA 6020 from 'Test Methods for Evaluating Solid Wastes' (EPA, 1986), and various methods for general chemistry parameters found in the aforementioned documents as well as 'Standard Methods for the Examination of Water and Wastes' (APHA, 1998). All surface water, groundwater, spring, and non-contact cooling water samples will have standard field parameter list indicators measured including temperature, pH, conductivity, dissolved oxygen, and turbidity.

The objectives for analytical data quality are defined in terms of the quantitation limits achievable using the referenced analytical methods, and in terms of the resulting goals for precision, accuracy, representativeness, completeness, and comparability of analytical data. Quantitation limits are provided for each analytical parameter in Tables QAPP-2 through QAPP-4 and are cross-referenced to an applicable standard EPA reference method. The quality objectives established for long-term monitoring are described as follows:

- Precision: analytical precision shall be reported on field duplicates and matrix spike/ matrix spike duplicate sample data as required by the governing EPA reference methods cited in Tables QAPP-2 through QAPP-4. Specific precision criteria for the governing methods as required by data validation guidelines, are presented in Tables QAPP-2 through QAPP-4 and in the Quality Control Summary tables (Tables QAPP-6 through QAPP-8);
- Accuracy (Bias): accuracy shall be reported from certified standard recovery, blank spike recovery, and matrix spike recoveries as required by the governing EPA reference methods cited in Tables QAPP-2 through QAPP-4. Specific accuracy criteria for the governing methods as required by data validation guidelines are provided in Tables QAPP-2 through QAPP-4 and in the Quality Control Summary tables (Tables QAPP-6 through QAPP-8);
- Representativeness: Goals for sample representativeness are addressed qualitatively by the sampling locations and intervals defined in the Work Plan. In addition, the use of standard procedures for sample acquisition (as described in Section 4 of this QAPP) will facilitate the collection of representative data;



- Completeness: Completeness is defined as the percentage of valid analytical determinations with respect to the total number of requested determinations in a given sample delivery group; completeness goals are established at 90%. Failure to meet this criterion shall be documented and evaluated in the data validation process described in Section 6 of this QAPP, and corrective action taken as warranted on a case-by-case basis; and
- Comparability: Approved analytical procedures shall require the consistent use of the reporting techniques and units specified by the EPA reference methods cited in Tables QAPP-2 through QAPP-4 in order to facilitate the comparability of data sets from sequential sampling rounds in terms of their precision and accuracy.



4.0 SAMPLING AND OTHER FIELD PROCEDURES

4.1 Selected Procedures

Technical procedures have been developed to support sampling activities, monitoring actions, data validation, and other technical activities. Reference to technical procedures applicable to individual activities, are provided in Table QAPP-1, ('Golder Technical and Quality Procedures List'), and complete copies for selected technical procedures are provided in Appendix C of the Groundwater and Surface Water Sampling and Monitoring Plan.

Technical Procedures are provided as guidance to technical personnel and as such, require the specific circumstance of application or the knowledge of the field scientist to appropriately apply the guidance criteria. Some technical procedures may have duplicate or similar information provided in other technical procedures that is necessary to be included to provide continuity to the content of the document. Significant changes in the field to technical procedure guidance will be identified and included on a Field Change Request form (TG-1.2-23, "Chain of Custody").

4.2 Water Sampling

Groundwater, surface water, spring, and non-contact cooling water quality samples will be collected to provide information to characterize groundwater and surface water quality and evaluate water quality trends. Samples will be collected from monitoring wells, Plant production wells, springs, surface water locations along Soda Creek, and non-contact cooling water. Groundwater levels will be measured in monitoring wells. Flows will be measured at surface water sampling locations and from springs.

The Groundwater and Surface Water Sampling and Monitoring Plan and Table QAPP-1 present technical guidance documents with procedures to collect groundwater and surface water samples and measure groundwater elevations and surface water flows. Substantial changes in the field to established procedures for water quality sampling, groundwater elevation measurement, and flow measurement will be subject to a 'Field Change Request' requiring approval from the Golder Project Manager.

4.3 Document Distribution, Variation Request, and Change Control Considerations

The technical procedures and all other procedures cited in this QAPP are subject to the distribution control requirements of QP-5.1, "Document Preparation, Distribution, and Change Control." Variations from established field procedure requirements may be necessary in response to unique circumstances encountered during sampling activities. All such variations must be documented on a Field Change Request (FCR) form and submitted to the Project Manager for review and approval. A copy of the Field Change Request form is presented in TG-1.2-23 "Chain of Custody", Exhibit D.



The Project Manager or his assigned Field Sampling Personnel are authorized to implement non-substantive variations based on immediate need, provided that the Project Manager is notified within 24 hours of the variation, and the FCR is forwarded to the Project Manager for review within 2 working days. Substantive variations require notification of the Project Manager, the Work Plan Coordinator, and Potentially Liable Party (PLP) representative prior to implementation, and by forwarding an FCR for review within 2 working days. If the variation is unacceptable to any or all of the reviewers, the activity shall be re-performed or other corrective action taken as indicated in the "Comments" section of the FCR. A copy of the FCR shall be included with all field reports, as well as the data validation report. Changes to the requirements of this QAPP or the Work Plan shall be controlled through the Interim Change Notice (ICN) procedures as discussed in Section 6.5.2 of QP-5.1.

4.4 Sample Quantities, Types, Locations, and Intervals

Sample quantities, types, locations, and intervals for the groundwater shall be as specified in the Groundwater and Surface Water Sampling and Monitoring Plan. Field quality control samples shall be included in the minimum quantities specified in Section 7 of this QAPP. Appropriate documentation of the purpose of the sample shall be maintained in the field log, and identified by the assigned sample number; copies of sample identification records shall be separately provided to the data validator. See Section 6 of this QAPP.

4.5 Sample Identification and Labeling Requirements

Sample labels will be attached to each sample container with an assigned field sample identification number applied as each sample is collected during the field activities. The number system will appear on each sample bottle or container collected and will identify a unique sample ID number applied to one collection sequence for one sample, regardless of the number of bottles and containers collected. The number system will ensure field QC samples will remain indistinguishable from the field locations. The label will contain the sampler's initials, one collection date, and one collection time appropriate for each sample, and will be cross referenced by the sample number to identify the location, depth, or monitoring well number with geological data in the field notes. An example label is provided as follows:

Golder Associates Sample Number:
Preservative:
Sample Date:/ / Time:



Each sample bottle label will also identify the laboratory analysis to be performed, noting the identified method number as stated in Tables QAPP-2 and QAPP-3 and the preservative added for the appropriate analytical parameter as indicated on the bottle label. Identification numbers shall be recorded on the field report logs and sample integrity data sheets with the applicable sampling procedures, and on the chain of custody/sample analysis request form supplied to the analytical laboratory.

4.6 Sample Container Type, Volume, Preservation, and Handling Requirements

All sample containers, container preparation, preservatives, trip blank (as necessary), and sample storage chests shall be provided by the analytical laboratory as part of their agreement for services. Sample container type, volume requirements, preservation requirements, and special handling requirements are listed by analytical category in Table QAPP-5 for all water matrices.

All samples shall be sealed, labeled, properly identified, and submitted to the analytical laboratory under formal chain of custody requirements as described in Section 4.7 of this QAPP. Transport sample chests will be secured with a custody seal on the outside, with signature and date provided by the attending field scientist.

4.7 Chain of Custody Considerations

All samples obtained during the course of this investigation shall be controlled as required by procedure TG-1.2-23, "Chain of Custody." Chain of custody forms (see Exhibit C in TG-1.2-23) shall be completed for each shipment of samples as described in the procedure. Chain of Custody forms shall specifically identify the applicable reference methods specified in Tables QAPP-2 and QAPP-3 as appropriate for each individual sample. Sample Integrity Data Sheets (see Exhibit B in TG-1.2-23) shall be completed for all sample collection locations, and cross reference the location and sample depth with the sample identification entered on the Chain of Custody. All laboratory chain of custody and sample tracking procedures shall ensure traceability of analytical results to the original samples through the analytical method referenced on the chain of custody, and the laboratory applied tracking number, which is traceable to unique sample identification numbers as specified in Section 4.5 above.

4.8 Sampling Equipment Decontamination

Most monitoring wells at the Monsanto project site have dedicated sampling apparatus to collect representative samples unique to the aquifer zone and depth for the well being sampled. Other locations not suited to a dedicated system will be sampled using appropriately decontaminated equipment. All non-dedicated sampling equipment (in contact with sample) shall be thoroughly cleaned prior to each sampling event to prevent cross-contamination between samples and to ensure accurate representation of analytes of interest in each sample interval. Personnel performing decontamination shall wear rubber gloves, face or eye shields, and such other safety equipment as directed by the project-specific HASP. A summary of steps used to attain proper decontamination follows:



- Samplers and sampling tools shall be disassembled as necessary and placed in clean, dedicated buckets during and after decontamination procedures to collect wash and rinse fluids.
- For samples requiring inorganic analyses, non-dedicated equipment shall be cleaned with a brush and non-phosphate detergent water mixture such that all visible solid matter is removed.
- Steam cleaning may be conducted on drilling augers or down-hole soil sampling equipment in place of hand washing.
- A second wash is performed on non-dedicated equipment after the detergent/ water wash.
- A second and final rinse of distilled/deionized water is then applied and the sampler is ready for use.
- If the sampler will not be used immediately, it should be stored for short term in a clean plastic bag or container to protect against ambient air contaminants.

If the non-dedicated equipment retains visible matter that is not amenable to cleaning after the previously stated actions, the equipment will be retired from the sampling procedures and not used again. Samplers shall be reassembled using clean rubber gloves. All wash and rinse fluids shall be transferred to purge water collection devices, and sent for disposal to the purge water collection pond reserved for that purpose.

4.9 Calibration Requirements

Calibration of all measuring and test equipment, whether in existing inventory or purchased for this investigation, shall be controlled as required by procedure QP-11.1, "Calibration and Maintenance of Measuring and Test Equipment." Lease equipment shall require certifications or other documentation demonstrating acceptable calibration status for the entire period of use for this project. Field calibration requirements shall be in compliance with the technical procedure describing the instrument's use and/or with the manufacturer's instructions issued with the equipment. Method and analytical equipment-specific calibration requirements applicable within the individual analytical laboratories are addressed by the individual laboratory QA plans.



5.0 ANALYTICAL PROCEDURES

Tables QAPP-2 through QAPP-8 cross-reference the analytes of interest of this investigation to the standard reference methods, practical quantitation limits (PQLs), quality control guidelines, and sample handling procedures that shall be established as contractual requirements between Golder and the subcontracted analytical laboratory. The subcontracted laboratory is responsible for implementing the analytical methods selected, documenting through Standard Operating Procedures (SOP) modifications (if any) to the methods, and providing these documents for review upon request. Any changes to the method number selected for analysis and identified in Tables QAPP-2 through QAPP-4 must first be brought to the attention of the Golder Project Manager in writing before analysis can commence.

The contractual requirements for PQLs and the most appropriate analytical methods are based upon historical records established for the site and requirements for satisfying cleanup standard guidelines as stated in National Recommended Water Quality Criteria: 2002, (EPA, 2002a), and the Idaho primary and secondary groundwater quality standards as presented in the Idaho Department Administrative Policy Act 58, Title 01, Chapter 11; Groundwater Quality Rule, (IDAPA, 1997). Where necessary, the laboratory will select the most appropriate method required to meet the cleanup standard.



6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Minimum Requirements for Laboratory Analytical Data Packages

All analytical data packages submitted by the analytical laboratory shall include the following:

- Sample receipt "condition found" record, noting dates of sample receipt; chain-of-custody and shipping documentation including identification of field sampling personnel, and shipping personnel (or organization); copies of completed chain of custody documentation;
- Analytical hard copy (paper) summary results for each sample containing neat or dilution adjusted results for all analytes/constituents requested in the chain of custody, request for analysis or purchase order;
- Analytical quality control results and summary documents for initial and continuing calibration standards, laboratory method blanks, duplicates, laboratory control samples, blank spike/blank spike duplicates, matrix spike/matrix spike duplicates, method of standard additions, serial dilutions, surrogates and internal standards;
- Sample extraction and preparation summary data including dates of sample extraction and analysis and analytical sequence information for each sample set, and each sample dilution and reanalysis, and
- Electronic data diskettes or electronic deliverables that provide the summarized results, date of extraction and analysis, quality control data results and true values, client and laboratory sample identifications, analysis methods, dilutions applied and appropriate detection or reporting limits.

All data packages for all analytical parameters shall be reviewed and approved by the analytical laboratory's QA Officer prior to submittal for validation.

6.2 General Validation Requirements

All analytical data packages from each sample delivery group shall be validated by the detailed review and calculation over-check processes described in "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (USEPA, 2004). Data validation guidance will be augmented in part by "Guidance on Environmental Data Verification and Data Validation; EPA QA/G-8" (EPA, 2002b). Data validation work will be performed in order to ensure that the laboratory has met all contractual requirements, all applicable reference method requirements, and has met the data quality objectives discussed previously in Section 3 and Tables QAPP-2 through QAPP-8. Validated data will be stored as indicated in procedure TP-2.2-12, "Analytical Data Management" for each sample delivery group. A sample delivery group may be interpreted as a group of twenty samples, or the group of samples delivered to the laboratory in a single week, whichever occurs first.

The data validator shall document all contacts made with the laboratory to resolve questions related to the data package. The data validator shall prepare a technical report applicable for the specified method, documenting the evaluation of laboratory blanks, field blanks, equipment blanks, duplicates, matrix spikes/matrix spike duplicates, laboratory control samples, calibration data, and any re-qualification of analytical results required as a result of the validation exercise. The validation report, laboratory contact



documentation, copies of the laboratory sample summary reports, and the as-reviewed laboratory data package shall be routed to the Project Manager for data assessment purposes and to the permanent project records.



7.0 QUALITY CONTROL PROCEDURES

7.1 Field Generated Quality Control Samples

All analytical samples shall be subject to quality control (QC) measures in both the field and laboratory. The following minimum field quality control requirements apply to all analyses. These requirements are adapted from "Test Methods for Evaluating Solid Waste" (SW-846) (EPA 1986).

- Field duplicate samples. An effort will be made to obtain sufficient sample quantities for the purpose of collecting field duplicates. Field duplicates will be collected of surface and groundwater samples that are suspected, based upon field observations, to contain contaminants, and where volume requirements are sufficient. Duplicate samples shall be collected from the same sampling location using the same equipment and sampling technique, and shall be placed into identically prepared and preserved containers. Therefore, duplicate samples will be generated for water collected from groundwater wells and surface water locations at the frequency noted in Tables QAPP-7 and QAPP-8 of at least one duplicate sample for every 20 samples. All field duplicates shall be identified with a unique sample ID number and will be analyzed independently (blind) as an indication of gross errors in sampling techniques;
- Split Laboratory samples. Split samples are identical samples collected at the same time in the same way, contained and transported in the same manner, but are sent to an alternate laboratory. Split samples are used as a performance audit of the primary laboratory. At a minimum, at least one split sample for every 20 samples,, or one split shall be collected per sampling event, whichever is greater. Split sampling shall be distributed evenly throughout each sampling period, with representative samples suspected to contain contaminants and where volume requirements are sufficient;
- Equipment blanks. Equipment blanks shall consist of pure deionized/ distilled commercially available water washed through decontaminated non-dedicated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks verify the adequacy of sample containers, non-dedicated sampling equipment decontamination procedures, and the proficiency of the field technician to eliminate fugitive contaminants. Therefore, equipment blanks will be generated for water collected from groundwater wells and surface water locations at the frequency noted in Tables QAPP-7 and QAPP-8. The equipment blanks shall be collected at a location based upon the potential for the presence of field contaminants; and
- *Trip blanks.* Trip blanks will not be required of the participating laboratory, unless and until contaminants are found in batch equipment blanks with interfering quantities of analytes that cannot be explained by sampling error, or by laboratory error. If required, they shall be created and tested by the laboratory prior to shipment, accompanied with the environmental sample set, and then returned unopened to the laboratory. The use of trip blanks will be at the Project Manager's direction, and are prepared as a check on possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions.

7.2 Laboratory Quality Control Samples

The internal quality control checks performed by the analytical laboratory shall meet the following minimum requirements:

Matrix spike and matrix spike duplicate samples. Matrix spike and matrix spike duplicate samples require the addition of a known quantity of a representative analyte of interest to the sample as a measure of recovery percentage. The spike shall be made in a replicate of a field sample or field duplicate sample. Replicate samples are separate aliquots removed from the same sample container in the laboratory. Spike compound



- selection, quantities, and concentrations shall be described in the laboratories analytical procedures as appropriate to the analytical method. One sample shall be spiked per analytical batch, or once every 20 samples, whichever is greater, and
- Quality control reference samples (check samples). A quality control reference sample shall be prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. The quality control reference sample is analyzed after the initial calibration and before any samples are analyzed, and shall be run with every analytical batch, or every 20 samples, whichever is greater. Reference samples are required as an independent check on analytical technique and methodology.
- **Method blanks.** Method blanks are prepared during the preparation of samples in the laboratory to determine the proficiency of the laboratory at eliminating fugitive vapors, reagent contaminants, and preparation vessel carryover contaminants. The method blank shall be prepared using the same procedure used for preparation of the samples, at the same time, and involving the same reagents. The method blank must be tested after the quality control reference sample and before any samples are analyzed, and shall be run with every analytical batch or 20 samples, whichever is more frequent.



8.0 DATA ASSESSMENT PROCEDURES

As previously discussed in Section 6, analytical data shall first be compiled by the analytical laboratory, and reduced to include the specified deliverable elements. The data will be validated by project personnel in compliance with existing validation guidelines and then reported to the Project Manager and to the Client. Data assessment will be performed on the distributions and statistical characteristics of the validated data, and will consist primarily of comparisons of the data to applicable regulatory levels and historical data to assist in site characterization.



9.0 DATA MANAGEMENT

Data management involves the routing and storage of all incoming data and correspondences unique to the project activities for the purpose of security, ease of access, and compliance with project goals. The following sections describe standards in place to complete the data management process.

9.1 Records Management

All records generated for project work, will be filed and maintained in access controlled project archives as required by procedure QP-16.1 "Quality Assurance Records Management". Records are defined as completed and signed documents that provide evidence of a service or a communication relevant to the project. Records produced during the course of the Monsanto Soda Springs project may include, but not be limited to:

- Incoming and outgoing correspondence and facsimile transmissions;
- Analytical data packages and analytical quotes;
- Project contracts, agreements, and amendments;
- Purchase orders and subcontractor agreements, quotes and receipts;
- Historical file copies of the data and communiqué provided by the Monsanto Soda Springs site and representatives;
- The Work Plan, Quality Assurance Project Plan, and Health and Safety Plan;
- Technical field logs and field reports;
- Interim change reports, procedure alteration checklists, surveillance inspection reports, and non-conformance/ incidence reports; and
- Computer disk files, and electronic copies of analytical data, and relevant E-mail communiqué.

9.2 Analytical Data Management

Laboratory data will be provided to Golder in both hard copy (paper) and electronic format. The paper copy will be routed to the data validator for confirmation of analytical data receipt and subsequent validation activities. Electronic data, by diskette, or by electronic (E-mail) delivery will be reserved by the data management specialist. The electronic data will include completed report copy versions in 'pdf' or facsimile form, and in spreadsheet form amenable to inclusion by electronic import to a database. Validated analytical data packages and diskettes will be routed to the project records for controlled storage and the validated data shall be processed into the analytical database in accordance with guidance found in Technical Procedure TP-2.2-12 "Analytical Data Management".

9.3 Data Review and Reporting

Following receipt and final data validation of groundwater analytical results, concentrations of detected analytes will be compared to established action levels. The proposed action levels for water quality at the



project site are provided in QAPP Tables QAPP-2 and QAPP-3 when compared to surface water criteria (EPA, 2002a) or groundwater criteria (IDAPA, 1997).

Once data has been received, validated and reviewed it will be included into a summary report. The report will include the date of the sampling event, a discussion of groundwater and surface water findings, a tabular presentation of water analytical results, and comparison to established action levels for the site.

9.4 Records Turnover

Records turnovers shall be in accordance with the Quality Procedure QP-16.1 and shall be inspected prior to transmittal by the Golder Project Manager or his designee.



10.0 REFERENCES

- APHA, 1998, <u>Standard Methods for the Examination of Water and Wastewater</u>, 20th Edition, American Public Health Association, 1998.
- EPA, 1983, Methods for Chemical Analysis of Water and Wastes (EPA-600/ 4-79-02), March, 1983.
- EPA, 1986, Test Methods for Evaluating Solid Waste, Third Edition, (SW-846), November, 1986).
- EPA, 1998), EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, (EPA/600/R-98/018), February 1998.
- EPA, 2002a, National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047.
- EPA, 2002b, Guidance on Environmental Data Verification and <u>Data Validation; EPA QA;/G-8</u>, United States Environmental Protection Agency, Office of Environmental Information, EPA/240/R-02/004, November, 2002.
- EPA, 2004, <u>USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA-540/R-04-004)</u>, October, 2004.
- Golder Associates Inc., 1992, Phase II Remedial Investigation Work Plan.
- Golder Associates Inc., 2010, Groundwater and Surface Water Sampling and Monitoring Plan
- (IDAPA, 1997); Idaho Administrative Policy Act, <u>Ground Water Quality Rule</u>, IDAPA 58, Title 01, Chapter 11, March 20, 1997.
- USEPA, 1999, USEPA Contract Laboratory Program Statement of Work for Organics, OLM04.2, August 1999.
- USEPA, 2000, <u>USEPA Contract Laboratory Program Statement of Work for Inorganics, ILM04.1</u>, January 2000.



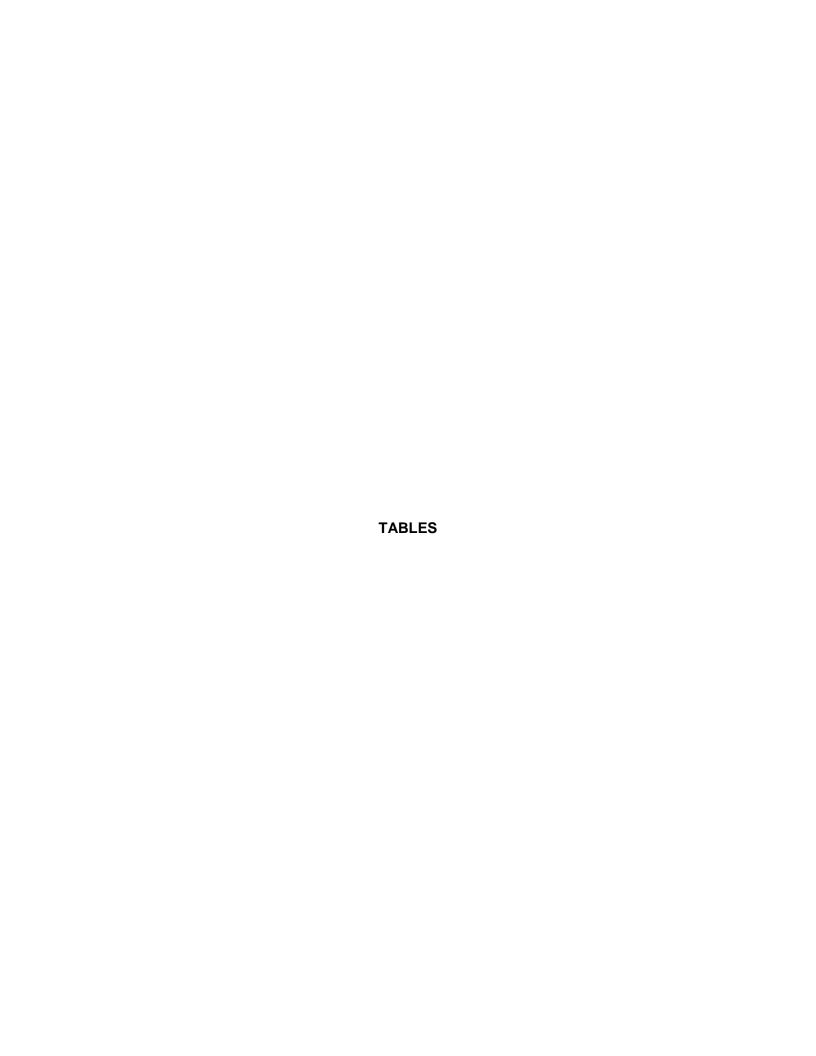


Table QAPP - 1

Golder Technical Procedures And Quality Procedure Documents

TG-1.2-20	Collection of Groundwater Quality Samples
TG-1.2-23	Chain of Custody
TP-1.2-26	Surface Water Sampling Methods
Tp-1.2-27	Measurement of Stream Discharge Using a Current Meter
TG-1.4-6a	Manual Groundwater Level Measurement
TP-2.2-12	Analytical Data Management
QP-5.1	Document Preparation, Distribution, and Change Control
QP-10.1	Surveillance Inspection
QP-11.1	Calibration and Maintenance of Measuring and Test Equipment
QP-14.1	Corrective and Preventive Action
QP-16.1	Quality Assurance Records Management



Table QAPP-2 Groundwater Sample Collection / Metal Analytes

		Idaho Groundwater Quality Standards ^a	National Surface Water Quality Criteria ^b	Idaho Surface Water Criteria ^c	Method Re	ference and F	Reporting L	.imits (RL)		l Quality ntrol
Parameter	CAS Number	Units (µg/L)	Units (µg/L)	Units (µg/L)	ICP-AES ^d	RL Units (µg/L)	ICP-MS ^e	RL Units (µg/L)	Precision RPD	Accuracy % Recov.
Cadmium	7440-43-9	5	0.246	0.6	6010C	5	6020A	1	<20%	75-125%
Calcium	7440-70-2	NA	NA	NA	6010C	5000			<20%	75-125%
Magnesium	7439-95-4	NA	NA	NA	6010C	5000			<20%	75-125%
Manganese	7439-96-5	50 ^{II}	NA	NA	6010C	10	6020A	1	<20%	75-125%
Molybdenum	7439-98-7	NA	NA	NA	6010C	8			<20%	75-125%
Potassium	7440-09-7	NA	NA	NA	6010C	5000			<20%	75-125%
Selenium	7782-49-2	50	5	5	6010C / SM 3114C	200	6020A	3	<20%	75-125%
Sodium	7440-23-5	NA	NA	NA	6010C	5000			<20%	75-125%
Vanadium	7440-62-2	NA	NA	NA	6010C	30	6020A	1	<20%	75-125%
Zinc	7440-66-6	5000 ^{II}	120	120	6010C	60	6020A	2	<20%	75-125%

Notes:

NA Not available for this analyte.

- a Idaho Primary Constituent Groundwater Quality Standards unless indicated as Secondary Constituent Groundwater Quality Standard (Superscript 'II' designation identifies an Idaho Secondary Constituent Groundwater Quality Standard per IDAPA 58.01.11).
- b National Recommended Water Quality Criteria: 2002; Values are for freshwater chronic criteria concentrations using a hardness coefficient of 100 mg/L where applicable (Shaded value is currently below Method Reporting Limits for the method cited).
- c. IDAPA 58 Water Quality Standards, chronic criteria
- d ICP-AES; Ion coupled plasma and atomic emission spectroscopy (except Se). Reference from 'Methods for Chemical Analysis of Water and Wastes'
 - (EPA-600/ 4-79-02).
- e ICP-MS; Ion coupled plasma and mass spectrometry.



Table QAPP-3

Groundwater Sample Collection / General Chemistry Analytes

Parameter	Idaho Groundwater Quality Standards ^a	National Surface Water Quality Criteria ^b	Idaho Surface Water Quality Criteria ^c	Method Reference ^d	Detection Reporting Limit	Precision RPD ^e	Accuracy % Recovery
Total Alkalinity (as CaCO₃)	NA	20 mg/L		SM 2320B	1 mg/l	<20%	75-125%
Ammonia/ Ammonium (as N)	NA	pH, Temp. dependent	pH, Temp. dependent	EPA 350.1	0.01 mg/l	<20%	75-125%
Chloride	250 mg/L"	230 mg/L		EPA 300.0	1 mg/l	<20%	75-125%
Fluoride	4 mg/L			EPA 300.0	1 mg/l	<20%	75-125%
Nitrate/Nitrite (as N)	10 mg/L			EPA 353.2	0.05 mg/l	<20%	75-125%
Total Phosphorus (as P)	NA			EPA 365.2	0.01 mg/l	<20%	75-125%
Sulfate	250 mg/L ^{II}			EPA 300.0	1 mg/l	<20%	75-125%
TDS	500 mg/L ^{II}			SM 2540 C	10 mg/l	<20%	NA

Notes:

- a Idaho Primary Constituent Groundwater Quality Standards unless indicated as Secondary Constituent Groundwater Quality Standard by superscript II.
- b National Recommended Water Quality Criteria: 2002; Values are for freshwater chronic criteria concentrations using a hardness coefficient of 100 mg/L where applicable.
- C IDAPA 58 Water Quality Standards, chronic criteria
- d Methods for Chemical Analysis of Water and Wastes, (EPA, 1983); Standard Methods for Examination of Water and Wastewater, (APHA, 1998).
- e Relative Percent Difference.



Table QAPP-4 Groundwater Field Parameter Monitoring List

Field Tests	Method _a	Target Water PQL ^b	Typical Instrument Applied ^c
Temperature	SM2550	0.1 deg. C	Golder Calibrated Mercury Thermometer
			Orion 3 Star with pH Electrode or Model 250Aplus with Combination
рН	EPA 150.1	0.05 units	Glass Electrode.
			Orion 3 Star with Conductivity Electrode Cell or Model 115Aplus with
Specific Conductance	EPA 120.1	5 umhos/cm	Epoxy 2 Electrode Conductivity Cell.
Turbidity	EPA 180.1	1 NTU	Hach 2100P with dual optical compensation.
			Orion 3 Star with Dissolved Oxygen Electrode or Model 810Aplus with
Dissolved Oxygen	SM4500-O	0.1 mg/L	Combination Glass Electrode.

Notes:

- a Methods cited are from 'Methods for the Chemical Analysis of Water and Wastes' (EPA-600/4-79-20; EPA1979); and 'Standard Methods for the Examination of Water & Wastewater' (1998, 20th Ed.)
- b PQL: Practical Quantitation Limits established by Manufacturers recommendation.
- c Orion and Hach are registered trademarks. Refer to instrument operator manuals for calibration and troubleshooting.



Table QAPP-5
Groundwater Sample Container Types, Volumes, Handling, Preservation, and Holding Times

Analytes	Analytical Method	Container Type	Special Handling	Preservation	Maximum Holding Time
pH, Temperature, Conductivity, Dissolved Oxygen, Turbidity	See Table QAPP-3	Field Parameters; Sample is not collected	See Table QAPP-6	Field Parameters; Sample is not collected	Field Parameters; Sample is not collected
Dissolved Metals, Selenium	EPA 6010B / 6020 SM 3114C	1, 1000 mL polyethylene bottle.	Use 0.45 um filter only for samples with turbidity >5 NTU (Bailer collected samples only). Collect into preserved bottle, fill to neck	HNO ₃ , pH < 2, store at 4°C.	6 months 6 months
Total Metals, Selenium	EPA 6010B/ 6020 SM 3114C	1, 1000 mL polyethylene bottle.	Fill to neck	HNO ₃ , pH < 2, store at 4°C	6 months 6 months
Total Alkalinity	EPA 310.1	1, 1000 mL narrow mouth polyethylene bottle.	Fill to neck, do not uncap until ready for analysis	None, store at 4°C	14 days
Total Phosphorus, Ammonia and Ammonium, Nitrate+Nitrite-N	EPA 365.2 EPA 350.1 EPA 353.2	1, 1000 mL narrow mouth polyethylene bottle.	Fill to neck	H₂SO₄, pH <2, store at at 4°C.	28 days
Chloride, Fluoride, Sulfate	EPA 300.0	1, 1000 mL polyethylene bottle.	Fill to neck	None, store at 4°C	28 days
Total Dissolved Solids	EPA 160.1	1, 1000 mL polyethylene bottle.	Fill to neck	None, store at 4°C	7 days



Table QAPP-6 Quality Control Summary; Metal Analyses

Parameter	Description
Method Reference	Methods for Chemical Analysis of Water and Wastes, (EPA, 1983); Test Methods for Evaluating Solid Waste; SW-846, (EPA, 1986) Standard Methods for Examination of Water and Wastewater, (APHA, 1998)
Matrix	Surface water, Groundwater.
Analytes	Metals lists as indicated in Table QAPP-2.
Holding Time	6 Months.
Laboratory Instrument Calibration	ICP: A blank and at least one calibration standard. The low level standards must be analyzed at the method specified concentration at the required frequency.
Laboratory Method Blank	Blank sample is analyzed at each analyte parameter and no analytes should be found in the blank. At least one preparation blank must be prepared for each matrix per 20 field samples or each batch whichever is more frequent. If any analyte concentration in the preparation blank is above the reporting limit, the lowest concentration of that analyte in the associated sample must be 10 times the concentration in the blank.
Laboratory Calibration	Laboratory calibration blanks analyzed at beginning and end of analytical batch and after initial and continuing calibration or every 10 samples or two hours, whichever is more frequent.
Equipment Blanks	GROUNDWATER: Equipment blanks will be collected at a minimum frequency of one per each set of twenty samples collected, for each type of collection device used. SURFACE WATER: Equipment blanks will be collected at a minimum frequency of one per each set of twenty samples collected.
Laboratory QC Check Standards	ICP initial calibration verified with independent standard %R 90-110. Digest an independent LCS with each sample batch for ICP if available %R 80-120.
Duplicate Sample	GROUNDWATER: Field duplicates are scheduled to be collected at a minimum frequency of one per each set of twenty samples collected. Each is prepared as a blind field duplicate. Relative percent differences (RPD) between field duplicates are advisory only; ≤20% for water samples. (MS/MSD or BS/BSD checked for RPD also). SURFACE WATER: Field duplicates will be collected at a minimum frequency of one per each set of twenty samples collected. Additional criteria as above.
Laboratory Matrix Spike/ Matrix Spike Duplicate Sample	Analyze spiked field sample at frequency of one per twenty samples or each batch, whichever is more frequent for groundwater and surface water samples. Percent recovery (%R) between 80-120%. Use method of standard additions for Se by hydride generation if interference is indicated.
Sample Collection	WATER: 1,000 ml polyethylene bottle acidified with HN03 to pH <2 and cool to 4°C.
Other Laboratory QC Criteria	ICP: Analyze ICS at beginning and at end of run or twice during 8 hour shift, whichever is more frequent. Results $\pm 20\%$ of true value. To verify linearity near the detection limit, analyze standard at 2X the limit and analyze at the beginning and end of the run or twice per 8 hours. Serial dilution analysis performed if concentration is 50X limit, must agree $\pm 10\%$ of the original value. All measurements minimum of 2 replicate exposures, report average. Se by hydride generation: Serial dilution analysis performed if concentration is 25X limit, must agree $\pm 10\%$ of the original value. Method of standard additions required if interference is indicated.



Quality Control Summary; General Chemistry Analyses

Parameter	Metals
Method Reference	Chemical Methods for the Analysis of Water and Waste.
B.4. ()	Standard Methods for the Examination of Water and Wastes.
Matrix	Groundwater, Surface water.
Analytes	Total Alkalinity (as CaCO ₃), Ammonia and Ammonium (as N), Chloride, Fluoride, Sulfate, Nitrate+nitrite-N, Total Phosphorus (as P), TDS.
Holding Time	28 days for chloride, fluoride, sulfate, unpreserved.
	28 days for ammonia, nitrate/nitrite, phosphorus if preserved.
	14 days for alkalinity unpreserved, and 7 days for TDS, unpreserved.
Calibration	A blank and at least three calibration standards for spectrophotometer, and anion analysis. One standard must be analyzed at or near the method reporting limit. Verify calibration prior to sample analysis, every twenty samples and at the conclusion of sample analysis. Balance check with NIST traceable standard weight for TDS analysis.
Method Blank	Blank sample is analyzed at each analyte parameter and no analytes should be found in the blank. At least one preparation blank must be prepared for each matrix per 20 field samples or each batch whichever is more frequent. If any analyte concentration in the preparation blank is above the reporting limit, the lowest concentration of that analyte in the associated sample must be 10 times the concentration in the blank.
Other Blanks	Analyze calibration blank at beginning and end of analytical batch and after initial
	and continuing calibration or every 10 samples or two hours, whichever is more frequent. Evaluate other associated blanks such as equipment blanks and field blanks at the same frequency of method blank analyses above.
QC Check	Initial calibration verified with independent standard %R 90-110, with the
Standards	exception of TDS. Digest an independent LCS with each sample batch for each matrix if available, acceptable %Recovery 80-120.
Duplicate Sample	Analyze one duplicate per 20 field samples or each batch for each matrix. Relative percent difference (RPD) ≤20% for water samples ≤35% for soil samples. Blind field duplicate sample recommended.
Spike Sample	Analyze spike field sample at frequency of one per twenty samples or each batch, whichever is more frequent for each matrix. Percent recovery (%R) between 80-120%.
Sample Collection	Water for Nitrite/Nitrate, Ammonia, & Phosphorus analysis; 1000 ml, preserve with H2SO4 to pH < 2, refrigerate at 4°C. Water for Chloride, Fluoride, Sulfate, Alkalinity analysis; 1000 ml polyethylene bottle unpreserved, refrigerate at 4°C.
Other QC Criteria	Analyze ICS at beginning and at end of run or twice during 8 hour shift, whichever is more frequent. Results $\pm 20\%$ of true value. To verify linearity near the detection limit, analyze standard at 2X the limit and analyze at the beginning and end of the run or twice per 8 hours. Verify linear ranges quarterly. Results must be within $\pm 5\%$ of true value. All measurements minimum of 2 replicate exposures, report average.



Quality Control Summary; Field Parameters

Parameter	Description					
Method References	GAI Technical Procedures TG-1.2-20, Collection of Groundwater Quality Samples; TP-1.2-26 Surface Water Sampling Methods. Orion and Hach Technical Operator Manuals					
Matrix	Surface Water (Streams) and Groundwater (well sampling).					
Analytes	pH, specific conductivity, dissolved oxygen, turbidity, and temperature.					
Maximum Holding Time	Record all field parameters immediately upon collection or during steady state conditions.					
Calibration	At least two reference buffers or standards at a high and low concentration are used to calibrate pH, conductivity. A blank and at least one calibration standard shall be used for turbidity, and dissolved oxygen slope determined by saturated atmosphere. Verify calibration prior to sample analysis and at the conclusion of sample analysis. NIST traceable thermometer shall be used for temperature measurements, no field calibration is required.					
Method Blank	A method blank or rinse blank sample is analyzed when required to check calibration.					
Equipment Blanks	Equipment blanks will include monitoring of distilled or deionized water used in equipment preparation as appropriate.					
QC Check Standards	Reanalysis of standards following field sample analyses is required. Verification of standards values should be $\pm 10\%$.					
Surrogate	NA					
Internal Standard	NA					
Duplicate Sample	Duplicate sample analyses are not required, however, repeat analysis of a second sample aliquot is recommended for all parameters and required for groundwater sampling to verify stability of field measurements within 10% for all parameters (0.5 °C for temperature).					
Spike Sample	Spike sample analyses are not required.					
Sample Collection	Minimize both atmospheric contact and delay on analyses of all field parameters. A closed cell sampling configuration may be used.					
Other QC Criteria	The working calibration must be verified before and after field sampling analyses. If the response for any analyte varies from the expected value by more than $\pm 10\%$ (0.5 °C for temperature), the test must be repeated using fresh calibration standards.					

